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Industrial Patents

THE processes of the law are rarely satisfactory to all concerned. In its simplest form law is the concrete expression of what is right and just as between human beings, but even when all the facts are undisputed, the intricacy of modern law necessitates the employment of some thousands of the highest intellects in the land for its elucidation. No longer is truth as expressed in the Statute Book a two-sided figure symbolical of straight right and wrong. Truth is a many-sided jewel that shines more brightly now from one face and now from another. Those skilled in such matters may and will, for a suitably high fee, polish one facet in preference to others so that its glint may reflect more brightly the beams of the legal luminary, the judge, and so may be taken, or mistaken, for the truth.

In the course of his address as chairman of British Celanese, Ltd., last week, Dr. Henry Dreyfus, referring to the recent action which has taken its place among the *cause célèbres* of the chemical industry, remarked that " it has been made apparent that our lack of success was in the main due to our want of experience in matters of this description. This experience we have now gained and we shall not hesitate to use it in the future. . . ." If Dr. Dreyfus's analysis of the case is correct it reveals a position singularly disquieting to all who may be engaged in research and invention.

To say that the longest purse that can pay the most skilled lawyers starts with an excellent handicap allowance is but another way of expressing the allegory of the jewel; but this further suggestion that given equally long purses and all the advantages that modern organisation can provide the victory is still to the experienced means that the inexperienced inventor starts with an even greater handicap than was formerly supposed. Great firms have now their patent departments that not only carry their own ideas into effect in the patent office, but watch also the patents of others. It is not surprising in these circumstances to find Dr. Dreyfus declaring that " the recent litigation has made it more than ever clear that the British patent law and procedure as they exist to-day present very great difficulties to the new inventor, particularly to one who has not at his disposal very substantial financial resources. In this respect the law and practice in this country are much more difficult and complicated than the corresponding laws in France and America."

Dr. Dreyfus declares his intention of endeavouring to secure amendment of the patent situation in this country, but he will probably experience some difficulty in getting any further alteration at this stage in view of the thorough revision undertaken in the Patents and Designs Act so recently as 1932. Nevertheless, it cannot be denied that the ideal justice for all is not adequately safeguarded at present. There is the well known difficulty in all legal business that cases can be taken to a higher court so that the man or firm with a long purse who can stand the geometrically-increasing expenditure wins by reason of his opponent's inability or unwillingness to risk bankruptcy. There is also the difficulty of improving patents. It happens quite frequently that an inventor is too poor to work out his own ideas, some of which may tax the resources of quite important concerns. The inventor thereupon takes his scheme to a laboratory or works and, assisted by them, works it up to conclusion. During the course of this work, the assisting party may make contributions in the nature of additive patents that so far obscure the original idea that the real inventor is unable to claim the reward which is his due. Dr. Bergius has recorded his difficulties on the score of finance and particularly refers also to the position that after an inventor has spent years of work and a great deal of capital so that his invention has reached the stage of preliminary patents, " the big danger looms up of parallel patents being taken out which may jeopardise the invention at this early stage."

In short the wolves are ever lying in wait for the weak or incautious traveller along the dark road of invention. The new Act is not yet satisfactory in its treatment of the poor inventor; it divides the amendments after acceptance, which may be opposed, into two classes; in the second group, amendments to sealed patents, cases must be heard in the High Court, so that once a patent is sealed the poor inventor in effect cannot defend his amendments if they should be questioned. The masses of " paper patents " that burden inventor and manufacturer alike should be swept away, and although complete satisfaction in this respect is difficult to secure, the 1932 Act has undoubtedly helped, even if it has not yet given the Comptroller adequate power to control the subject matter before acceptance. Fictitious inventions should be prevented from becoming patents where they only stand in the way of genuine advances. The cost of revocation is extremely high—another difficulty in the way of the poorer inventor who may not be able either to attack a blocking patent nor to defend his own. Nevertheless, the powers of the Comptroller over subject-matter should not be too wide, because his views could only be fought by the employment of highly-skilled and expensive men, and such powers might raise difficulties in regard to undeveloped patents of unproved commercial value.

Notes and Comments

The General Election

THE municipal elections are over and the Parliamentary contest will be a matter of history by the end of next week. It is not a bad thing from the point of view of the business community that these inevitable electoral disturbances should have come at the same time. Whatever happens at the polls on November 14, manufacturers and traders will at least know where they are for a substantial period ahead. There is nothing so inimical to business as uncertainty, and it is common knowledge that the placing of many important contracts has been delayed until the national choice of a new Government has been declared. Too much can be made of the results of municipal elections into which local factors unrelated to Parliamentary considerations properly enter. At the same time, account can fairly be taken of the broad tendency emerging from the borough contests on November 1.

What they reveal are a certain steadiness of outlook on the part of the local government electors and the absence of spectacular success for any of the national parties where the campaign had a definitely political flavour. This steadiness suggests that urban voters are not at the moment prepared to embark on any revolutionary experiments. What commerce and industry chiefly demand is the sort of dispensation which will give them confidence to develop and expand. Given that confidence, the natural revival, which has brought the community new hope during the last few months, should make headway for a further season. It will assuredly be the aim of the business man to cast his vote on November 14 for the forces which represent in his view the best prospect of sustained stability and ordered progress. Very few of the candidates nominated on Monday are directly associated with the chemical industry, but there are many who have been brought into contact with its problems in various ways and who will therefore have the support of the industry in their constituencies next week.

International Nitrate Situation

THE annual report of the Ruhr Chemical Corporation, of Oberhausen (Rhineland), for the year ended June 30, presents a somewhat pessimistic view of the international nitrate situation. Referring to the prolongation of the International Nitrate Producers' Association for another three years, the report points out that the preliminary condition for a steady distribution of exports has been secured, but that a further shrinkage in exports must be expected, in view of the extension of the domestic production of the importing countries. The difference between the capacity of the producing plants and the consumption has further increased by the construction of new plants in the Far East. As to the German nitrate situation the production has been slightly higher than during the preceding year. Exports have continued to decline from a third of the total sales last year to two-sevenths this year, whereas domestic sales have advanced by about 10 per cent. The high hopes of a substantial increase in domestic sales as a result of the reduction in prices by 7 per cent. have not materialised.

On the other hand, lower prices have resulted in substantial losses to the Ruhr Chemical Corporation, and these losses have only been balanced by extraordinary profits resulting from the redemption of its foreign indebtedness. The works of the company were operating at less than 40 per cent. of capacity. Its sales last year aggregated 20,800 metric tons of pure nitrate for fertilising purposes and 2,200 metric tons for mechanical purposes, compared with 21,300 and 1,700 metric tons respectively for the preceding year. In view of the unfavourable nitrate situation, the Ruhr Chemical Corporation has paid more attention to the production of petrol from coal and has established the new Ruhr-Benzin Co. The capital needed for the first plants of this new company is given at Rm.13,500,000, of which Rm.4,500,000 will be provided by the Ruhr coal industry, and the balance of Rm.9,000,000 by German banks.

Research into Coal By-Products

WE commented last week upon the proposal to create a coke oven research organisation which should conduct its work upon existing ovens put at the disposal of the staff by the coke oven owners of the country. Whilst a scheme based on a "travelling" research staff might be admirable from the point of view of coke research there is no possibility of isolating the gases from individual ovens. This method would preclude work upon the by-products, and the industry would tend to become a purely coke-making undertaking, instead of taking its rightful place among the producers of chemicals. The whole problem is a difficult one and the other branches of the chemical industry will be interested to see how it is solved. The nature of the research organisation must be intimately bound up with the proposed lines of development of the industry. Some of these were suggested in the presidential address delivered by Mr. T. Westthorp, from which a few paragraphs may be quoted in illustration: "The treatment of gas for new chemical products should be investigated . . . liquid fuels and plastics can be produced, whilst as a source of hydrogen, coke oven gas is still the cheapest. Perhaps the most promising variant to present uses of tar will be found in hydrogenation when the technique of the process is sufficiently advanced to enable small units to be profitably attached to coke oven plants of medium size." The present leaders of the industry visualise greater advances on the chemical side than on purely fuel production. That is a fact that must be taken into account when the constitution of the proposed research organisation is settled.

Any proposal to set up a research organisation must be carefully explored by those who have had wide experience of research in order that when the necessary financial support shall have been obtained, the money may be expended in such a way as shall enable the staff to do really valuable work. The research organisation, as we see it, has a real contribution to make to the prosperity of the industry by indicating new lines upon which coal by-products can be utilised so as to develop the chemical side of the industry equally, or in advance of its purely fuel aspect.

Inflammability and Fireproofing of Rubber

Method of Testing Fire Resistance

THE earliest British reference to the fireproofing of rubber has been traced to Bethel (Brit. Pat. 7731/1838), who was concerned with simultaneously waterproofing and fireproofing wood and fabrics with rubber and mineral salts; definitely fireproofed rubber compositions were mentioned by Longbottom in 1865, these being moulded raw rubber plastics; whilst vulcanised rubber was apparently first considered from this point of view by Alexander Parkes, the well-known discoverer of "cold curing," in Brit. Pat. 5388/1882. Since that time the patents and references to fireproofed rubber have increased rapidly in numbers, said Mr. T. R. Dawson, M.Sc., F.I.C., F.I.R.I., in a paper read before the Institution of the Rubber Industry, on November 4.

Mr. Dawson laid stress on the relative value of such terms as fireproof, flameproof, and the like. As a working definition for everyday use, he said, fireproof rubber was regarded as material which does not propagate flame—it may char, break down to gas, and burn locally in a strongly heated zone, but the flames do not spread to the unheated part of the rubber and extinguish spontaneously when the source of heat is removed. For quantitative studies in fireproofing, the definitions of the British Standards Institution in 1932 were taken as an admirable basis.

Diversified Operations

Methods of testing the fire resistance of rubber and other solids were considered in some detail. They all involve applying heat to a test-piece and observing some consequence of the application, but these apparently simple operations have been diversified in a surprising variety of ways.

The method and rate (or temperature) of application of heat, the ways in which the specimen is supported, the air supply, and the criteria used for measuring the heat attack are all very important. Determinations of temperature or time of ignition are common and have some indirect relation to fire resistance as defined above. The more generally-used methods of test, however, involve observation of the effects of predetermined amounts of heat. Thus, the common specification tests (British Admiralty and Post Office, U.S. Navy, New York City Building Code, and others) involve holding standard strips of rubber in some standard flame, defined in terms of gas pressure and thermal capacity or in terms of the height and diameter of the flame itself, and observing the failure to ignite or the time required for extinction of ignited specimens on withdrawal from the flame. The French Government has laid down more precise conditions and standardised a small electrical furnace built up of slabs and prisms of refractory material and heated by an electric "candle." The rubber specimen is heated on the hearth of this apparatus by radiant heat from the electric coil.

British Standard Test

The British Standards Institution has a very different and excellent test in which a 6-inch square test-piece, inclined at 45° to the horizontal, is heated by the flame obtained from a fixed quantity of absolute alcohol burning in a standard crucible, the extent of scorching of the square determining whether the specimen is "non-inflammable," of "very low inflammability," or of "low inflammability."

Turning to fireproofing agents for rubber, Mr. Dawson said that only three modes of action had been suggested—dilution of the combustible matter by inert bodies such as many of the usual mineral fillers; use of bodies which fuse to glassy layers, such as borates and phosphates; and use of bodies evolving volumes of fire-extinguishing gases, such as carbonates, tartrates, ammonium salts, and so on. The specific and unexplained action of selenium in fireproofing rubber stands outside these categories.

Rubber fireproofing agents should possess a blend of properties unfortunately not found in any of the existing agents proposed. Owing to the need to use them in amounts up to 50 per cent. of the volume of the rubber mixing, their effects on the properties of the vulcanisates could not be neglected. Thus, they should not give off highly poisonous fumes, should not have pronounced odour or colour, should not corrode metal inclusions or tender fabrics or promote staining and discolouration, should affect mechanical properties and ageing of rubber as little as possible, and should not make the rubber highly hygroscopic. Examples of these different effects were instanced in connection with the principal types of fireproofed rubber goods—fire hose, electrical insulation, flooring, sponge rubber upholstery, and balloon fabric.

Scarcity of Data

As there is an almost complete absence in the literature of quantitative data on the effects of rubber fireproofing agents, a comparison was made of twelve of the more important. A typical rubber flooring mixing was used as a base stock, coloured white to facilitate observation of charring. Two tests were made on the samples: (1) Heating strips in a Meker burner flame, and (2) the B.S.I. alcohol flame test. In the strip test, such agents as asbestine, clay, selenium, tricresyl phosphate, and chlorinated synthetic rubber failed to stop continuous burning after 3-10 seconds in the flame, but aluminium hydrate, chlorinated rubber, calcium tartrate, urea, borax, and chlorinated waxes were all positively effective not only in preventing spread of flame to unheated parts of the rubber but in causing rapid extinction of the ignited portion. In the B.S.I. test on 6-inch squares the results were generally similar.

In view of the ill-effects of water absorption in cable insulation and flooring, all the samples were tested for this property by immersion in water at 25° C. It was found that urea and borax gave very high and rapid absorption and would be impossible agents for general use in rubber. All the other ingredients were either innocuous in this respect or even beneficial in some cases, no doubt by diluting the available volume of absorbent material.

It was thus possible to conclude with safety that a variety of agents are available, both inorganic and organic, which greatly improve the fire resistance of vulcanised rubber and make it practically impossible to burn it except in a vigorous and continually applied flame.

Research on Plastics

New United States Laboratory

A NEW section for research on organic plastics has been formed in the National Bureau of Standards, United States Department of Commerce. The increasing use of organic plastic materials by the various Government departments, coupled with a growing volume of requests for information concerning these products, made it imperative that a survey of their sources, properties and uses be made. In addition to supplying this technical information on the broad aspects of this subject to Government officials and the public, detailed studies of some of these organic plastics have been made at the National Bureau of Standards in connection with research problems submitted to other Government agencies. United States plastics production has grown rapidly. In 1934 domestic production of synthetic resins of coal tar origin totalled over 55,000,000 lb., according to the Tariff Commission, compared with 1,500,000 lb. in 1921. Over 3,500,000 lb. of synthetic resins of non-coal-tar origin were also produced domestically in 1934.

British Tar for British Roads

Sir David Milne-Watson on the Five-Year Road Plan

SIR DAVID MILNE-WATSON presided at the eighth annual meeting of the British Road Tar Association at the Hotel Metropole, London, on Wednesday afternoon. Speaking at a luncheon which preceded the meeting, Sir David said it was gratifying to learn from the recent pronouncements of Mr. Neville Chamberlain and Mr. Hore-Belisha, that £100,000,000 was to be expended by the Government over the next five years on road reconstruction. This was valuable so far as it went, but £100,000,000 in five years was only at the rate of £20,000,000 per year. That there now appeared to be a genuine desire on the part of the Government to release more money for roads no one would question, but the true measure of their help would only be revealed when they received details of how this £20,000,000 a year was to be spent and what proportion was to be devoted to new and additional road works not included in the existing provisional allocations.

Co-operation Between Road Authorities

He suggested that there was a need for closer co-operation between local authorities and the Ministry of Transport, together with adequate co-ordination between local authorities to enable the main roads throughout the country to be developed in a uniform manner without changing the character of the road and its surface, now so prevalent and dangerous. General progress on these lines would obviously benefit British road-making and all its allied industries.

The Ministry of Transport was experimenting and devoting much time to one of the fundamentals for reducing road accidents, namely, the provision of durable non-skid surfacing. The Association's efforts, also, had been continuously directed—both individually and collectively—by its own research workers and in collaboration with the Government's research workers—to the improvement of their product. They had proved from many practical experiments that roads safe for all types of transport in all weathers could be laid with tar as the binder—and numerous successful instances existed on main arterial roads, carrying heavy traffic. Whilst tar was a "black" product, it was not necessary for tar roads to be black, as with a suitable aggregate they could easily be made light in colour. One also saw frequent reference to cars being damaged by tar and chippings thrown off the road surface. Everything that was black on the road was not necessarily tar, and there was no reason for discomfort or waste of money if adequate care and attention were given to the proper application of the tar and chippings to the road. Improvement in the actual application of tar for surface treatment of roads had not increased pro rata to the improved quality of tar itself, and there was need for greater care and attention in this direction. Too often tar was unjustly made the scapegoat in cases of unsuccessful road work when in fact the real cause might be one of a number of other variables.

An Entirely British Product

Tar was a 100 per cent. British product. The more tar used on the roads and the less products of foreign origin, so British industry proportionately benefited. A lead had already been given by the Government for the use of British materials on roads, and the Ministry of Transport was exercising its influence in this direction, but what was desired is a direct lead to all responsible local authorities to use this 100 per cent. British product of tar.

The steady and unquestioned improvement in the quality of tar during recent years had resulted at the present time in less tar being consumed. This was due to the tar roads lasting longer than formerly and relaying or resurfacing was only required after greater intervals of time. To counteract this reduced consumption, ample scope was available for increasing the mileage of British roads to benefit from the advantages of the application of tar.

The technology of road tar was already of big dimensions and was ever being added to, and the usefulness of the International Road Tar Conference in this respect was becoming more and more apparent. Their research work carried out in collaboration with the Department of Scientific and Industrial Research was progressing to an extent which would ultimately be of benefit to all members, and the public. Research work was necessarily slow, but was never more essential in all industrial activities than it was to-day.

Dry Cleaning with Triklone

New Imperial Chemical Industries Publication

THE use of non-inflammable solvents as dry-cleaning fluids has increased considerably as they have become commercially available in quantity. Trichlorethylene, in particular, has made rapid headway since it first came into general use for dry-cleaning in early post-war years. Progressive dry-cleaners, first attracted by its powerful grease-solvent properties and by the wide range of stains which it is able to remove, soon recognised the practical value of a solvent whose use involved no increased fire insurance premium on their premises, and which they could safely trust to be non-corrosive to equipment.

A 48-page handbook entitled "Dry-Cleaning with 'Triklone'" (pp. 48 2s. net) recently issued by the general chemical group of Imperial Chemical Industries, Ltd., deals with the use of "Triklone" (the trade name under which trichlorethylene for dry-cleaning purposes is marketed), and discusses its properties in relation to the various aspects of dry-cleaning.

A special section, illustrated by tabulated data, describes the effect of "Triklone" on various fabrics (with particular reference to woollen goods), on colours, and discusses the effect of using wet solvent (in relation to fabric tendering and plant corrosion). It is shown how well the solvent conforms to requirements in all three respects. A useful note on the proper storage of "Triklone" and on the technique of its distillation, explains how the solvent may be used with the maximum economy, and how its purity may be retained under conditions of use.

Some Simple Precautions

The second of the specialised sections deals with the few simple but necessary precautions to be observed in using "Triklone." Written from a detached scientific viewpoint, it should do much to clear up the present confusion in the public mind with regard to the effects on the human system of this and allied solvents. These effects are considered in relation to such physical properties of "Triklone" as may determine the choice of site for plant, the ventilation of the workshop, and the disposal of air containing "Triklone" vapour—all points of importance with any dry-cleaning solvent, and on which it is stated, the manufacturers of "Triklone" are available to give free advice at any time.

The final section dealing with stain removal is rather more specialised than the earlier general sections and gives details as precisely as possible of the materials required for, and the procedure to be adopted in, the art of spotting—in so far as it is possible to lay down rules for a process into which individual skill still enters so largely.

Properties and Uses of Bentonite

Rapidly Increasing Demand in Recent Years

ON the plains of Wyoming are found occasional spots which the early settlers called " soap-holes." They were filled to the surface with a sticky, jelly-like mass which never completely dried, and which had the appearance and feel of " soft-soap." These soap-holes occurred, according to a bulletin issued by the American Colloid Co., where lower beds of a peculiar light-coloured clay had been exposed by crevices or erosion of the top soil. Water seeping down caused the lower clay to swell remarkably and to fill the crevices with a gelatinous mass. Exploration in the soap-hole areas disclosed deposits, from a few inches to five feet or more in thickness, of this swelling clay, which was found to have many unusual properties. In the early eighties some commercial uses began, and occasional shipments were made from Wyoming to various parts of the United States. In 1898 it was given the name bentonite from its occurrence in the Fort Benton formations. Commercial consumption was small and irregular up to about 1920, but then began to grow steadily. In 1924 the Canadian Department of Mines published an informative bulletin on bentonite by Hugh S. Spence, which stimulated interest and research. Consumption in recent years has grown very rapidly and bentonite has become a standard ingredient of recognised value in many processes and products. True bentonite, as defined by the United States Geological Survey, occurs almost exclusively in Wyoming, with some smaller deposits in adjacent sections of Montana, the Dakotas and Canada. In a few limited areas the beds are close to the surface, but mainly bentonite is found deeper, and strata have been encountered by well drillers hundreds of feet below the surface.

Value of Swelling Properties

Its swelling properties are enlisted for sealing ditches and dikes, also the walls of oil wells during drilling. If loosely packed in crevices or pipes it will swell from contact with water so as effectually to close the opening against high pressures; it will not permanently harden and can be easily removed. The formation of smooth, gelatinous, inorganic pastes and gels lends itself to a great number of commercial uses. A few examples are in polishes, detergents, pharmaceuticals, cosmetics, lubricants, etc. As its thin gels increase the viscosity of water, they are employed to suspend and gelatinise particles of solids and semi-solids, for instance, in horticultural spray materials, foundry mould washes, pigments, ceramic glazes, cements and plasters. Also for aqueous suspensions of rubber and latex, which are often incorrectly called emulsions. Two interesting examples of the serviceability of this property of bentonite—apparently far apart but using exactly the same principle—are in drilling oil wells where the bentonite gel suspends the rock cuttings, and in taking X-rays of the human body—where it suspends the heavy particles of barium sulphate in the fluid which is administered internally. The negative polarity of bentonite particles is commercially useful. For example, carbon and carbonaceous soil carry positive charges and in de-inking paper and in laundry work and other washing processes such matter is strongly attracted to the bentonite particles and carried away in suspended state in the water. It is also used in clarifying food products as wine, vinegar and honey, in which the impurities cling to bentonite to form aggregates which flocculate and are easily removed. Its sorbent properties are employed for many purposes as in insecticides, fungicides, pharmaceuticals, cosmetics, detergents, etc. One of its most interesting accomplishments is to provide a means for dispersing other substances in extremely finely divided or colloidal state. The substance is prepared by dissolving it in a bentonite gel and later evaporating this gel to dryness; or by mixing it dry with the bentonite and melting it so that it permeates the pores. It is then adsorbed upon the surface of the microscopically-sized bentonite particles or absorbed into their still smaller cells and becomes likewise subdivided. The immense surface area gives it greatly increased activity when used in pastes, sprays or emulsions. Toxins, antiseptics, metal salts and sulphur are typical of the ingredients being successfully used in this ultra-dispersed form.

Stabilising Emulsions

Wyoming bentonite is widely and successfully used for stabilising emulsions of many water immiscible substances. It is more stable than soap for the purpose, being less affected by chemical changes in the solution and it is sometimes used together with a smaller proportion of soap. Its strong bond when slightly moistened leads to its extensive use in foundry sands, because so much less clay is required and the sand is more permeable to gases. Somewhat the same principle applies to its wide use for bonding sound and heat insulating blocks and plasters. Its plasticity improves the workability of bodies composed of lean or non-plastic materials as well as their ultimate strength when dried or burned. Although not a high refractory clay, it is nevertheless used in refractory compositions because of its other advantages; the small proportion required does not materially lower the melting point. Four methods can be used for making emulsions with Volclay bentonite, the fluid, the paste, the grinding, and the dry solid method.

The viscosity and suspending power of bentonite gels and sols are profoundly affected by very small quantities of electrolytes—soluble acids, alkalies and salts—in the water. All clays are to some degree influenced by electrolytes, but with bentonite the effect is intensified due to its greater surface area and other inherent properties. The normal reactions that occur between other clays and electrolytes do not occur in the same way with bentonite. Generally speaking, alkalies and acids have the most powerful effect, while the neutral electrolytes have less effect, although still influential. A concentration of 0.5 per cent. of alkali in water will destroy the suspending power of bentonite if it is added to the alkalinised water later; while if the dispersion of bentonite and water is already made and the same amount of alkali afterwards incorporated, an immense increase in viscosity will occur.

Increasing Viscosity

The principle of increasing the viscosity and carrying properties of bentonite suspensions is one that may be usefully employed in industrial processes, when it is desired to have as small a proportion of bentonite as possible in the final compound. Often one or two grams added to a gallon of dispersion will produce the desired thickening and the gel will then hold in suspension a larger quantity of heavier granular substances. Of course, the same effect is very easily achieved by increasing the amount of bentonite. If an excess of alkali or acid is present, partial flocculation will ensue, the bentonite gel will recede slightly after standing, and a layer of clear supernatant water will appear. The depth of this layer will be influenced by the concentration of bentonite in the water, a dilute concentration showing a deep layer and a heavy concentration showing very little, if any. Pure bentonite suspended in water will not show any supernatant liquid.

Bentonite is widely used in the manufacture of asphalt emulsions, which should be more correctly described as " aqueous dispersions " of asphalt. The usual commercial

process is to make a bentonite-water paste or gel, which should be as thick as the stirring or mixing mechanism will permit. This will be about 10 to 12 parts bentonite to 90 parts water. A stiff bentonite paste is desirable because in mixing the emulsion it exerts a tearing action against the natural tendency of the asphalt to coalesce. The bentonite-water gel is heated and the hot asphalt poured into it in a thin stream, while continuously stirring. After thorough mixing, the thick product can be further diluted with water, depending on its purpose. The final proportions of a fairly thick emulsison could be 10 parts bentonite, 90 parts water and 250 parts asphalt. For asphalt paint, 150 parts water with the above quantities of bentonite and asphalt would be effective.

Protection Against Coalescence

When the compound has been formed the bentonite surrounds the asphalt globules, making a protective sheath against coalescence. The mixture remains plastic when kept in a container, and need not be heated to be applied to a surface. While in the plastic or mobile condition the volume of the hydrated bentonite, due to its swelling properties, is about seven times that of its dry volume. When the material is spread upon a surface the water evaporates, and the bentonite shrinks back to its original dry volume, forming cells of microscopic size between the particles of asphalt. These cells, now dry, are porous and become permeated by the asphalt, which gradually reaches complete coalescence. The film or body is then impervious to water. The *p*H value of the final product is an important factor for stability. A slightly acid reaction is conductive to maintaining good adherence between the bentonite particles and the asphalt. Bentonite itself gives a slightly alkaline reaction in solutions and aluminium sulphate or small quantities of acids are sometimes added to the water to lower the *p*H. To improve suspendability, small amounts of other colloids may be helpful, as gum karaya, gelatine, starch or dextrin. One patented process mentions the use of citric or tartaric acid to improve mobility, permitting the making of fluid emulsions containing less water and more asphalt. Another mentions making separately soap-asphalt and bentonite-asphalt emulsions, then mixing them.

Addition to Soap Stocks

Bentonite may be added to soap stocks in proportions up to 40 per cent. and can be combined with any of the usual oils, fats, rosins, etc. Three general methods are employed. (a) The soap is made in the usual way, and the requisite amount of dry powdered bentonite is crutched in later. (b) Dry powdered bentonite is added to the melted fats in the soap pan, prior to the alkali. (c) The bentonite is dispersed in hot water and the melted fats stirred into it; the alkali is added last. The last method has special advantages. The reaction with alkali is effected more rapidly and completely when intimate contact is brought about between the oil, fat, rosin, etc., and the water. Even in a simple mixture the fats are more evenly and completely dispersed when bentonite is included; and if the mixture can be rapidly agitated an excellent emulsion will result, the fat or oil being dispersed in tiny globules which will not coalesce. As a result, the fats will present greatly increased surface area to the water and alkali, and, in addition to the speedier and more uniform reaction, the correct proportion of alkali can be more accurately gauged.

Certain liquid food products contain colloidal impurities which cause cloudiness; these impurities are usually of a protein nature and are positively charged. The particles of bentonite in water, however, are negatively charged, and, therefore, when mixed with these products, attract their positive impurities to form aggregates which flocculate and are easily removed. The use of certain bentonites for clarifying wines results in brilliantly clear products, which are stable to temperature changes, to sunlight and to storage. This process, which was developed by L. G. Saywell, is simple and rapid, and its successful results have given it wide commercial use in a short time. The amount required varies from 2 to 16 lb. or more to a thousand gallons of wine. It is merely mixed with the wine and stirred or circulated for an hour or two; flocculation of impurities commences when the agitation is stopped and sedimentation is completed in two to ten days. Many wineries are preceding even their rough filtration by a light bentonite treatment, because such a process removes a sufficient proportion of suspended solids to give them greater filter capacity with less equipment. When activated carbons are used, the small particles of carbon which are ordinarily difficult to remove are more thoroughly removed when bentonite is used in conjunction with the carbon. Bentonite also removes much of the excess iron from wines. One of the early mechanical difficulties in the use of bentonite for this purpose was the difficulty of dispersing it without special mixing equipment. The results were sufficiently successful to out-weigh this disadvantage, but recently a new quick dispersing bentonite has added further to the convenience of the method. The presence of certain types of colloids imparts objectionable properties to honey, especially to the darker kinds. These colloids are generally positively charged and can be removed by bentonite, improving the quality and clarity of the product. The honey is diluted with about 100 per cent. water, heated and mixed with a suspension of bentonite. After a 15-minute agitation it is filtered and the resulting clear solution is concentrated to original honey density. While this method produces a beautiful product, the cost of reconcentrating has been against its wide commercial use. This process was first described by R. E. Lothrop and H. S. Paine.

Analysis of Coal and Coke

Draft British Standard Methods

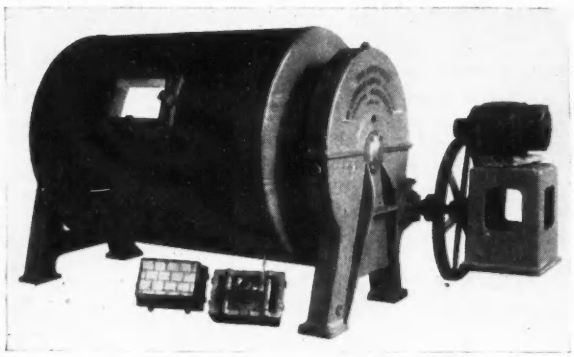
IN accordance with the usual procedure the Coal and Coke Technical Committee of the Chemical Division of the British Standards Institution has just circulated to interested organisations, and to the trade, draft British Standard methods for the sampling and analysis of coal and coke for short period tests on industrial plant and other appliances. This new draft standard deals comprehensively with a subject which has been a perennial source of trouble in the past. The specified methods are a development of the standards which have been previously issued by the Institution for the commercial buying and selling of coal and coke, and are based on the results of research which has been carried out by members of the committee.

The methods of sampling and the treatment of the sample have been so developed as to bring clearly before the user of the specification the effect on the accuracy of the variation in the weight of the sample. A table is included setting out the minimum weight of gross sample for maximum errors of ± 0.25 per cent., ±.5 per cent., ± .75 per cent., and ± 1 per cent. Very close details are specified for the method of collection and for the method of reduction, and full particulars are given in an appendix of a number of suitable forms of riffles or sample dividers. The draft standard methods give full particulars of the methods of analysis of coal and coke, together with standard methods of reporting the results.

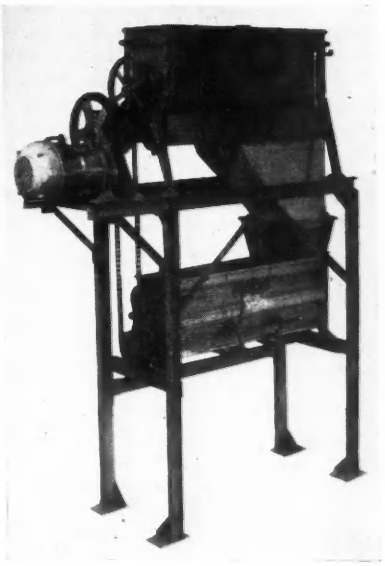
A new feature of interest is the introduction of a test in the coke section for the determination of the thermal value of the volatile matter, in addition to the usual determination of the percentage of volatile matter. The draft specification will, in accordance with the usual arrangements, be reviewed in five or six months' time, in the light of the criticisms received, and further modifications may then be made prior to its adoption and issue as a British Standard.

Mixing, Drying and Grinding

New Machinery with Direct-Coupled Electric Motors

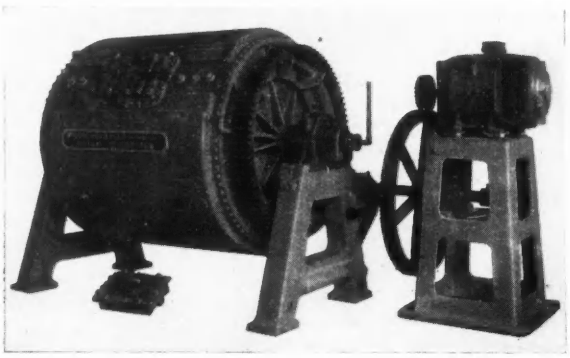


Porcelain-lined Ball Mills of the latest type incorporate many improvements and in many cases they are direct-coupled to an electric motor.

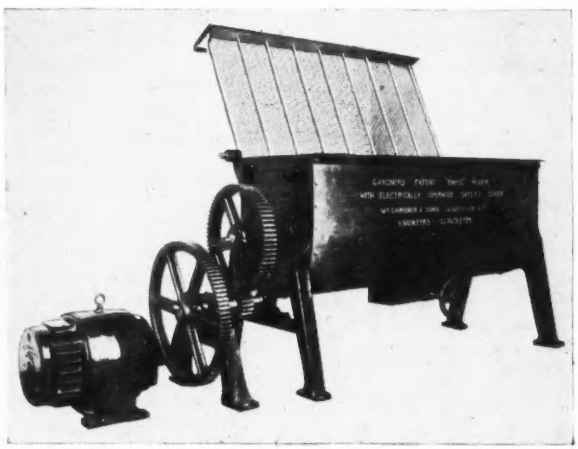


Right: This patent "Rapid" Gas-Heated Dryer is superimposed over a Patent "Rapid" Sifting Machine and is direct-coupled to an electric motor, the whole combined as one unit and fitted in channel-iron frame.

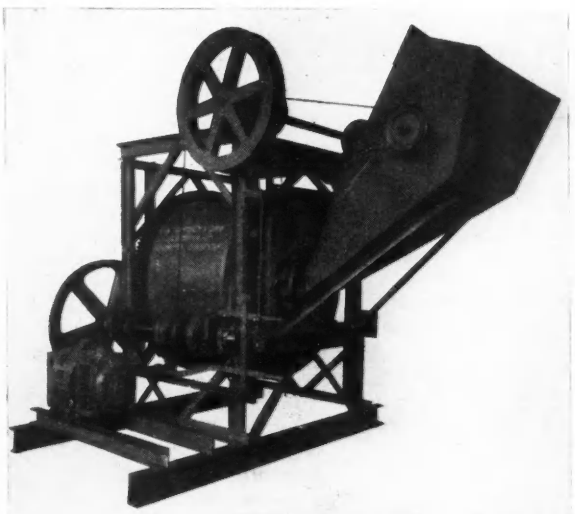
Chemical works which are equipped with modern machinery show a notable tendency to make good use of the advantages of the direct-coupled electric motor. These photographs show machines which are supplied by William Gardner and Sons (Gloucester), Ltd.



Water-jacketed Ball Mills can also be direct-coupled to an electric motor. This mill is one of the latest models of the water-jacketed type.



This "Rapid" Mixer is made from Monel metal throughout, and is fitted with a special safety cover which is closed during working operations; on opening the cover the machine stops automatically.



The Drum Type Mixer shown above is of special design. It is direct-coupled to an electric motor and is fitted with a friction clutch for operating the charging hopper, and simultaneously opening the dust-tight door over the inlet hole to the mixing drum. A special device is also fitted for cutting out the clutch when the hopper is at the required maximum height, whilst a brake is provided for controlling the lowering of the hopper.

Chemical Industry Finance

By S. HOWARD WITHEY, F.C.I.

DURING the twelve months to the end of March last a gross trading profit of £938,765 was made by Boots Pure Drug Co., Ltd., and after crediting sundry income, including a transfer of £4,328 from the development reserve to meet expenditure incurred in connection with new works at Beeston, the total was brought up to £944,740. This figure compares with £949,940 disclosed in the previous account, but after providing for depreciation, repairs and renewals, and allocating the usual £30,000 to the staff pension fund and paying increased directors' fees, the balance of net profit proved to be £5,171 higher at £750,037. The rate of dividend on the ordinary shares has been maintained at 29 per cent., of which 5 per cent. is tax free, so that the dividend is equal to 30.45 per cent. subject to tax. The issue of an additional £100,000 in ordinary shares in the early part of the year brought the total paid-up capital up to £3,000,000. The preference and the preferred dividends absorb £96,750 of the disposable balance, as before, while the dividend on the ordinary shares requires £464,000, as compared with £435,000 the previous year. Current assets are shown on the company's balance sheet at £1,550,341, including stocks amounting to £828,028. The ordinary shares were recently quoted at 49s., at which price the yield is about 3⅛ per cent.

During the same period a trading profit of £156,370 was made by Sangers, Ltd., after crediting profit on investments, representing an increase of £15,589 in relation to the previous year's figure, and after deducting income tax the net profit balance proved to be £118,677, which compares favourably with £106,358 shown in the 1933-34 account. The rate of dividend on the ordinary shares has consequently been raised from 20 per cent. to 22½ per cent., and the carry forward raised from £67,469 to £80,897. The floating assets total £433,582, and as the result of recent acquisitions the investments in subsidiaries have increased to £944,393. The ordinary shares are of 5s. denomination, and were recently quoted at 24s.

Distillers' Increased Profits

The audited accounts of the Distillers Co., Ltd., were made up to the middle of May last, the trading profit and other income totalling £2,293,032, after debiting taxes and depreciation and providing for contingencies. This is an increase of £73,875 in relation to the previous year's figure, and after charging interest on debentures and general expenses the net profit worked out at £2,213,133, which compares favourably with £2,140,621 realised in 1933-34. The dividend on the ordinary stock has been maintained at 20 per cent., and the carry forward raised from £316,339 to £319,073.

The continued demand for pig iron, and a larger production of steel, are reflected in the figures submitted by the Consett Iron Co., Ltd. During the twelve months to March last, the trading profit amounted to £321,593, which compares with £148,901 in 1933-34, and after adding income from house rents and deducting directors' fees, etc., there was a balance of £362,328. Debenture interest absorbed £100,000, as before, while £300,000 was provided for asset depreciation, thereby reducing the carry forward from £94,407 to £56,735. Floating assets were assessed for balance sheet purposes at £1,352,960, and overdrafts show a reduction of £81,976 at £189,445.

The recovery reported by the directors of the Powell Duffryn Steam Coal Co., Ltd., a year ago has been maintained, the profit for the past year being £321,033, which figure compares with £378,991 realised during the previous fifteen months. The book value of fixed assets has been reduced by means of an allocation of £100,000 to depreciation account, and after distributing an ordinary dividend of 6 per cent. the balance of £117,891 is added to the general reserve, which now amounts to £462,886. As from the beginning of April last, the assets and liabilities have been transferred to Powell Duffryn Associated Collieries, Ltd., as the result of amalgamation with Welsh Associated Collieries, Ltd.

Despite no improvement in the demand for cement, and severe competition in the export market, increased profits were made by Aberthaw and Bristol Channel Portland Cement, Ltd., during the year to March last. The trading profit rose by £6,041 to £50,656, and the net profit proved to be £29,623, representing an increase of £4,758. Last year the sum of £30,000 was provided for depreciation, but this year no special allocation has been made under this heading, so that a dividend of 7½ per cent. goes to the ordinary shareholders, leaving a credit balance of £36,392 to be carried forward to 1935-36, as against £44,268 brought in from 1933-34. The floating assets comprise stocks, book debts and cash totalling £181,904, while £200,000 has been deposited with bankers for the debenture holders. The 7½ per cent. preference shares were recently quoted at 26s. and the ordinary shares at 25s.

Improvement in Bleaching Trade

Better results were reported by Bleachers' Association, Ltd., the trading profit during the past year being £32,629 higher at £419,456. After debiting debenture interest and depreciation, also the cost of maintenance and repairs, there was a net profit of £26,531, as compared with a loss in 1933-34, which has been added to the carry forward. The general reserve fund amounts to £973,610 and current assets total £760,567, while the fixed assets amount to £7,814,125. There is a superannuation fund of £264,591; an insurance fund of £53,245; and an investments contingency fund of £57,358.

The gross profit of £33,441 made by the Yorkshire Dyeing and Proofing Co., Ltd., during the twelve months ended June last, compares with £45,353 shown in the previous account, while at £20,809 the margin of net profit registers a decline of £8,672. The dividend of 7½ per cent. has been repeated, and after transferring £7,500 to reserve, as compared with £15,000 allocated a year ago, there remains a credit balance of £5,364 to go forward, as against the sum of £6,305 brought in. Current assets appear on the company's balance sheet at £114,380, and fixed assets at £153,748, while the reserve now amounts to £32,500. At the recent price of 11s. 9d., the 10s. shares yield about 6.6 per cent.

The Cellulose Acetate Silk Co., Ltd., reported a trading profit of £42,406 for the past financial year, and, after adding other income, the balance amounted to £44,435. Depreciation and general expenses involved a total debit of £58,018, leaving a deficit of £13,582. The sum of £10,000 has been allocated to the contingencies reserve, so that the carry forward has been reduced from £66,009 to £42,427. The reduction of the excise duty caused a loss in respect of yarn stocks, and, although prices have been lower, there is some indication of a material improvement in demand at higher prices. The company has no debentures or preference shares, the issued capital of £1,020,933 comprising £1,150,000 in the form of ordinary £1 shares—recently marked at 11s. 3d.—and the balance in deferred shares of 1s. denomination.

SULPHUR Quarries, Ltd., Gaza, have recently had a British expert in operation of flotation plants to inspect their equipment. Improvements and extensions of the plant are contemplated.

Economics of the Synthetic Manufacture of Ammonia—VI

Ammonium Sulphate Plant, Boiler and Power Requirements

These notes were originally compiled in 1918, with the object of providing information necessary to decide whether it would be advantageous to manufacture ammonia synthetically as a commercial proposition in England. They are now published in the hope that they will prove useful to young chemical engineers, in showing the details involved in the preparation of such a scheme.

IF the ammonia synthesis process is required for the production of ammonia for subsequent oxidation to nitric acid or ammonium nitrate it is necessary that gaseous ammonia should be delivered to the oxidation plant, and for this purpose it was advisable to absorb the ammonia from the gases circulated in the ammonia synthesis plant by means of cooled, refrigerated ammonia liquor, which on warming to the normal temperature gave up in the gaseous condition such ammonias as it had absorbed.

The ammonia liquor could pass direct to a neutralisation tank, where it would be treated with sulphuric acid. If strong sulphuric acid is used (94 per cent.), the percentage of strength of ammonium sulphate solution obtained would be about 60 per cent. The solubility of ammonium sulphate is 78 grams per 100 grams of solution at 30°, therefore certain evaporation would be required. It would appear to be more economical to take the ammonia liquor and to evaporate it in a simple ammonia still and pass into chamber acid (60 per cent.) in the usual way, thereby obtaining a strength of solution through which the ammonium sulphate crystallises out. This ammonium sulphate and sludge then passes to a draining vessel and thence to a centrifuge.

The quantity of ammonia to be neutralised is 2,460 *lb. per hour,* and as a 25 per cent. solution has been assumed *the quantity of ammonia liquor* would be

$$\frac{2{,}460 \times 100}{25} = 9{,}840 \text{ lb. per hour.}$$

A non-arsenical acid of about 140° Tw. appears to be generally used for sulphate of ammonia manufacture, *i.e.,* 70-80 per cent. (say 75 per cent.).

Quantity of this acid required for neutralisation would therefore be

$$\frac{2{,}460}{34} \times \frac{98 \times 100}{75} = 9{,}450 \text{ lb.}$$

or allowing for loss (say)

$$9{,}450 \times \frac{100}{95} = 9{,}950 \text{ lb. per hour} = 107 \textit{ tons per day.}$$

The two alternatives are (a) to distil the 25 per cent. liquor and pass the ammonia vapour into the sulphuric acid in the ordinary way, obtaining ammonium sulphate in a crystallised state; (b) to neutralise the 25 per cent. liquor with sulphuric acid and evaporate the water from the ammonium sulphate solution obtained.

Heat of dilution of 25 per cent. NH_3 to very dilute solution ... ... 400 C.H.U. per 17 lb. NH_3.

Heat required to remove 17 lb. NH_3 from dilute solution ... ... 8,200 C.H.U. at 100° C.

Heat required to remove 17 lb. NH_3 from 25 per cent. solution ... ... 7,800 C.H.U. at 100° C. (Berthelot).

Heat required to remove 2,460 lb. from 25 per cent. solution ... ...

$$\frac{2{,}460 \times 7{,}800}{17} = 1{,}125{,}000 \text{ C.H.U.}$$

For heats of reaction $2NH_3 + 2H_2O = 2NH_4OH$ aq. + 15,120 C.H.U. per 34 lb. NH_3 and $2\ NH_4OH + H_2SO_4 = (NH_4)_2SO_4$ aq. + 28,600 C.H.U., giving a total of 43,720 C.H.U.

Heat obtained when 2,460 lb. of gaseous ammonia are absorbed in sulphuric acid is

$$\frac{2{,}460}{34} \times 43{,}720 = 3{,}160{,}000 \text{ C.H.U.}$$

On the other hand, if ammonia solution is neutralised only about

$$\frac{2{,}460}{34} \times 28{,}600 = 2{,}070{,}000 \text{ C.H.U. are obtained.}$$

In the first case, if ammonia vapour is distilled into 75 per cent. H_2SO_4 aq. the strength of ammonium sulphate solution obtained woud be about

$$2{,}460 + \frac{9{,}450 \times 75}{100} = 9{,}540 \text{ lb. in } 2{,}460 + 9{,}450 = 11{,}910 \text{ or 80 per cent.,}$$

and so the ammonium sulphate crystallises out at about 50° C.; but in the second case the strength of solution is 9,540 lb. in 9,840 + 9,450 = 19,290 lb. or 49.5 per cent., so that

$$\frac{(80 - 49.5)}{100} \times 19{,}290 = 5{,}870 \text{ lb. of water}$$

have to be removed so as to obtain a liquor which will crystallise conveniently; this represents (say)

$$550 \times 5{,}870 = 3{,}230{,}000 \textit{ C.H.U. per hour.}$$

It is obvious from a thermal point of view, therefore, that the first method is the more advantageous. In fact, there is a balance of heat 3,160,000 – 1,125,000 or 2,035,000 C.H.U. available for removal of the ammonia. It would seem, therefore, advisable to depart from the ordinary gasworks methods of working, so as to arrange to utilise this heat to effect the evaporation of the ammonia, thereby saving the steam which would be required in the second case to evaporate the water (*viz.,* about $\frac{5{,}870}{1.5} = 3{,}900$ lb. of steam per hour = nearly 100,000 lb. per day if a double-effect evaporator is used, employing 1 lb. of steam to remove 1.5 lb. of water).

It is, of course, necessary to heat the ammonia from (say) 20 to about 80° C. or through 60° requiring 9,840 × 60 × 1 = about 590,000 C.H.U. per hour, and there will be also a certain amount of water which will be evaporated along with the ammonia; but with a suitable still this ought to be small. The margin of heat ought therefore to be sufficient with satisfactory interchange arrangements.

It is sufficient to indicate that the acid would have to be introduced into a lead lined tank (the contents of which can be heated by live steam for starting purposes). This tank would be lagged externally. The incoming ammonia would pass through lead coils immersed in the acid ammonium sulphate in which the ammonia would be vaporised. It would be fractionated in a column outside, above the tank. The ammonia vapour would then be passed to the tank and be absorbed by the incoming acid, giving the necessary heat to evaporate the incoming ammonia. The flow of acid and ammonia could be regulated automatically. The hot ammonium sulphate liquor would then be removed from the tank and allowed to crystallise in a cooling vessel, from which the crystals would be removed mechanically to a draining vessel. The mother liquor would be fed again into the system along with the sulphuric acid. From the draining vessel the mother liquor would be further removed by vacuum (or if necessary by centrifuging as is normally carried out) and dried in a current of heated air. It would seem possible to carry out these latter processes in a single vessel or series of vessels. The ammonium sulphate would then be shovelled through a shute into bags in the packing house and be conveyed to store.

The production of sulphate of ammonia from *pure* 25 per cent. liquor ought to be a simple matter compared with the production from *impure* 2-3 per cent. gasworks liquor.

There are also about 2,920 lb. of gasworks liquor to be dealt with per hour. This should be kept separately from the main product as it would contain H_2S and CO_2 and other impurities; it will provide about four tons of ammonium sulphate over and above the 100 tons budgeted for.

Ammonium sulphate can also be produced according to the reaction:—

$(NH_4)_2CO_3$ aq. + $CaSO_4$ aq. = $(NH_4)_2SO_4$ aq. + $CaCO_3$

This reaction proceeds rapidly in the cold and it is possible to obtain a fair concentration of ammonium sulphate solution. The water would subsequently be removed in multiple effect evaporators, after filtering off and washing the lime carbonate.

There would be required about

$$\frac{100}{132} \times 135 \times \frac{100}{90} = 114 \text{ tons of calcium sulphate @ 90 per cent. per day.}$$

The difference of cost between 1 ton of chamber acid (75 per cent.) and

$$1 \times \frac{114}{107} = 1.07 \text{ tons of calcium sulphate}$$

would have to be balanced against the extra costs of evaporation, labour, etc., required for the calcium sulphate method.

The ammonium carbonate solution would be readily produced from the CO_2 removed from the catalysed water gas.

There would be a great advantage in producing *bicarbonate of ammonia* as a fertiliser instead of the sulphate, provided it is as suitable for agriculture. There is sufficient carbon dioxide produced in the process to be absorbed as bicarbonate in the ammonia produced. A number of scrubbers affording sufficient time of reaction for the comparatively slow reaction to take place would be nearly all the extra plant required, except that necessary for the retention, drying, etc., of the bicarbonate thrown out of solution.

The quantity of bicarbonate produced would be about 120 tons per day (instead of 100 tons per day of the sulphate). The percentage of nitrogen in the bicarbonate would be 17.5 as against about 21 in the sulphate. It would be advisable to install sulphate plant for the first unit installed, and in the meantime investigate the other methods and products, so that for the whole plant the most economical scheme can be adopted.

Boiler Plant

The boiler plant will be situated in a central position in the neighbourhood of the compressor house. The boilers will be gas fired with the gas from the vertical retorts after the removal of the bi-products therefrom. There are available from such gas

250 × 1,750,000 = 437,000,000 C.H.U. per day.

This will raise about 700,000 lb. of steam (taking 1 K.W.H. = 20 lb. steam = 2.5 lb. coal = 2.5 × 7,200 = 18,000 C.H.U., of which only 67 per cent. = 12,000 C.H.U. are effective in raising steam). Therefore,

$$\frac{437{,}000{,}000}{12{,}000} \times 20 = 729{,}000 \text{ lb. of steam}$$

or about four 600 h.p. boilers (B. and W.) would be required.

Connection should be made to the producer gas plant and space allowed for two or three extra boilers, so that power could be raised on the site if required. No power house will be required on the site unless the power for heating the bombs, etc., is to be produced on the site, in which case 30-40 tons of extra coal would have to be burned per 24 hours.

The compressor plant would be worked by steam power from the boiler plant, the steam raised by the retort gas being sufficient for this purpose. Non-condensing engines would be used for driving the compressors. The pressure of the incoming steam would be about 160 lb. and of the outgoing about 25 lb. absolute pressure. Low pressure steam would then pass to the convertor plant for catalysing water gas, etc. The engines would thus work at a mean effective pressure of about 60 lb., the available quantity of steam being 729,000 lb. and the h.p. for the compressor plant about 1,446 h.p.

Steam required would be

1,446 × 24 × 25 = 866,000 lb.

assuming 25 lb. of steam per b.h.p. under the conditions specified.

	lb.
Steam required for catalyst plant is	493,000,
for fractional combustion plant	263,000,
for producer plant	100,000.
Total	856,000.

Thus the quantity of steam from the compressor plant is sufficient to produce the required amount of low pressure steam. The quantity of high pressure steam required would be 137,000 lb. It would be raised by a small quantity of extra producer gas.

The steam and power for the vertical retorts could be raised from the waste heat and the flue gases; so also could the steam for the water gas plant be raised from its waste heat.

Power Requirements

Power requirements for the factory, for normal running, would be as follows:—

	K.W.
For heating bombs	750
For circulating pumps	100
For ammonia pumps	36
For water pumps (CO_2 plant)	225
For sundry purposes, *i.e.*, water pumps, blowers, boosters, etc.	300
Total	1,411

This power could be raised from three extra boilers at 600 h.p. each, the whole boiler plant consisting then of six 600 h.p. boilers. Producer gas corresponding to about 30-50 tons of coal would be required. By-products would be obtainable if this course were pursued. The quantity of power required on the plant from this source or from outside sources is about half the total power used on the plant, the rest being supplied by the gas raised in making the coke.

The quantity of water required per day can be given very approximately as follows:—

	Gallons
Cooling water for gas	3,000
Scrubbers for water and catalysed gas about	2,000,000
Water for CO_2 (circulated)	3,000,000
Cooling for compressors	5,000,000
Cooling for bomb exchangers	300,000
Process water for ammonia	15,000
Boiler water (maximum)	160,000

The process water for the ammonia should be condensed water and should contain as little dissolved gas as possible. The boiler water should be of suitable analyses, but the remainder of the water can be of ordinary quality, *e.g.*, river water filtered, and can be circulated so that only about 3 per cent. of the total quantity would be required, so as to make up for evaporation from the reservoirs.

(To be continued.)

FRENCH production of boric acid is exclusively by the Borax Francais, which at present has an annual output of about 800 metric tons and an estimated capacity of 1,600 metric tons. The French imports of boric acid during 1934 of 536 metric tons were from: Italy 339 tons; United States 183 tons; Great Britain 12 tons; and Germany 2 tons.

Letters to the Editor

The Editor welcomes expressions of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

Modern Hay-Making

SIR,—The reference in THE CHEMICAL AGE of October 26 to the grass drying machine to be marketed by Imperial Chemical Industries which, it is stated, will pay for itself within two years, recalls the interesting history of a recent industrial incursion into this process. It all arose through a dispute about the cost of ice cream. British ice cream makers use imported milk powder instead of British milk. The Milk Marketing Board wanted to know the reason why, and was told that if British milk were used a penny ice cream would cost 1½d. The Government does not permit ice cream makers to increase their prices as this would raise the cost of living. The Milk Marketing Board put the problem back on to the farmer who maintained that he could not produce milk cheaply enough to let the ice cream makers continue to make their penny ice cream because the yield of milk falls off so greatly in the winter. If in the winter he could produce at the summer yield the difficulty would disappear. He cannot do so because the nutritive value of the winter feeding stuffs is lower than in summer. The gas industry, ever anxious to sell its coke, had this problem investigated and it was found that grass will retain its full nutritive properties if it is cut green and short and dried immediately in machines fired by coke fuel.—Yours faithfully,

G.A.S.

Grass Drying in October

SIR,—The announcement of the Billingham grass drier has brought grass drying into the realm of practical politics, with the result that exceptional interest has been focused upon this method of obtaining winter fodder. Farmers from all parts of the country have already visited the farms in Warwickshire, Shropshire and Cheshire where the grass driers are installed, in order to see them at work. As a result of the mild autumn this year, grass has grown very rapidly and, consequently, much has been wasted. But on the farms where the driers are working it has been possible to cut and dry at the correct time, thus conserving many tons of valuable winter food.

Experience has shown that autumn grass does not give valuable pasturage—probably due to the fact that it contains a large amount of water. But when dried its food value is high enough for it to be fed as a concentrated food for beef and milk production. The analysis of the grass dried during the last four weeks—based on the average yield from the three counties—is more than encouraging. The total protein content has been found to be 17 per cent. and the starch equivalent about 58 per cent. These figures compare surprisingly with those of other feeding stuffs.—Yours faithfully,

SIDNEY ROGERSON.

Imperial Chemical Industries, Ltd.,
Millbank, S.W.1.

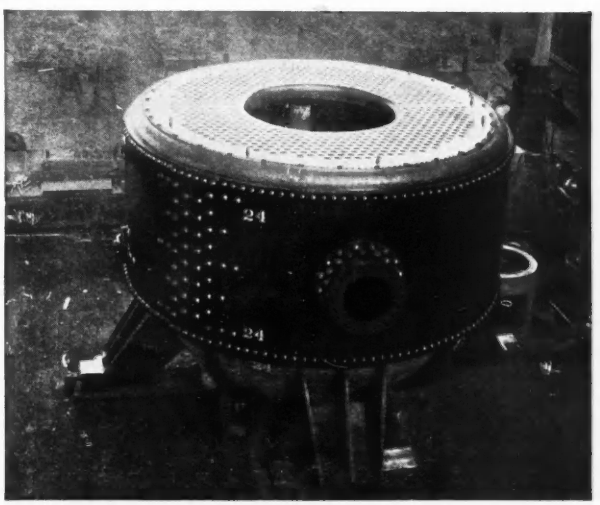
Caustic Soda Evaporators

Some Users' Experiences

THE suitability of nickel and Monel metal for the construction of caustic soda evaporators has been repeatedly proved in this and other countries. Both metals are highly resistant, but in the manufacture of caustic soda for certain industries, which demand copper-free caustic—pure nickel equipment is pre-eminent. Hot concentrated caustic solutions corrode iron rapidly enough to introduce an undesirable metal content into the solution. If exposure to the caustic is interrupted by periods of exposure to the air, to water or neutral solutions, the life of the equipment is shortened due to rust. Analyses have shown that 50 per cent. caustic soda, concentrated in evaporators fully equipped with nickel tubes and tube plates, runs usually under 0.00002 per cent. nickel. Monel metal has resistance to corrosion by caustic of the same order as that of nickel.

In a large Lancashire dyeing works, a caustic soda evaporator fitted with Monel metal tubes and tube plates has been in continuous service for approximately six years and during the whole of that period has cost nothing for repairs. In a neighbouring chemical works nickel tubes in an evaporator concentrating caustic to a 60 per cent. solution were recently inspected after six years' service and still found to be in very good condition. The probable life is estimated at 25 years. This firm's experience with iron tubes was that they generally failed in about 12 months, usually at the point where the tube had been expanded.

At an American works a nickel tube that had been for 21 months in an evaporator delivering caustic at 50 per cent concentration lost no appreciable weight and when cut open its original inside surface was found to be intact. Nickel tubes that had been in service for two years in a pan used in concentrating caustic soda to a 50 per cent. solution were found on microscopic examination to be completely sound and unattacked. Nickel tubes in service for three years on 50 per cent. caustic were corroded on the inner surface to the extent of only a slight surface etching as seen under the microscope. Monel metal tubes of 0.083-inch wall, after three years' service in an electrolytic caustic soda evaporator, were considered by the operators to be good for another ten years.



Caustic Soda Evaporator, 10 ft. diameter, with pure nickel tube plates and tubes, working at 200 lb. steam pressure.

I.C.I. Capital Reduction Petition

No Hidden Reserves

IN the Chancery Division, on Tuesday, Mr. Justice Eve resumed the hearing of the petition by Imperial Chemical Industries, Ltd., for confirmation of its capital re-organisation scheme. The proposal involved a reduction of the company's capital from £95,000,000 to £89,565,859. The petition was opposed.

Sir Wm. McLintock, chartered accountant, gave evidence on behalf of the I.C.I. He said there was no truth in the suggestion made by the critics of the scheme that the company had a hidden or undisclosed reserve, or that there were profits still "tucked away in the subsidiary companies." Nor was there any truth in the suggestion that hidden reserves had been created by making unduly high provision for maintenance. Some £2,600,000 was spent on maintenance in 1934. That was, taking the changed economic circumstances into account, practically the same figure as in 1929, when trade was good. The reserves which the company had made were ordinary provision and were not excessive. The reserves in 1934 amounted to £14,400,000.

Expenditure on Research

Sir Albert Wyon, a chartered accountant, who had given evidence by affadavit at a former hearing, was now cross-examined. He stated that £10,000,000 had been put to reserve out of assets during the eight years of the life of the company. No attempt to re-value the assets of the company had been made—such a thing would not be possible—but where an asset had permanently depreciated or had been disposed of, it had been written off. It was possible that other assets had appreciated in value. The company was spending large sums of money on research, which had yielded valuable returns. Dealing with subsidiary companies, witness admitted that the plant and machinery of these companies were kept in working efficiency. In his opinion not too much had been written off the value of the company's assets, so as to create any hidden reserve. The subsidiary companies had paid in dividends to the I.C.C., the whole of their profits, except £16,000 during the period of the existence of the I.C.I.

Sir Albert, in cross-examination, said he was not consulted about the proposal to amalgamate the deferred and the ordinary shares till after the scheme had been prepared. He was asked to consider the scheme and he did and he thought it was a good scheme. He thought the conditions of the scheme were fairly set out in the circular which was issued to the shareholders. He agreed that one could estimate the position of a company by regarding merely its dividend position. A more accurate guide to what was going to happen in the future was the earnings of the company.

Effect upon Deferred Shareholders

Sir Wm. Jowitt, K.C. (representing opposing shareholders): This scheme would cut down the capital of the company by more than £5,000,000 and there is no suggestion of a single penny piece having been lost?—Yes.

That reduction of capital is to be affected by writing down the shares of one class of shareholders?—Yes.

The scheme takes away from the deferred shareholders their contingent share in the reserves?—Yes. Their share in the reserves, if the reserves are ever distributed.

I am told that that means a figure of some £3,000,000?—Something like that.

Replying to further questions, Sir Albert maintained that the scheme had no effect on the rights of the deferred shareholders unless there was a distribution of the assets of the company. That was so remote that he did not think it worth while taking into account. He could not remember offhand any other case of a company applying to be allowed to reduce its capital when it had not lost any of it.

Dr. Wm. Henry Coates, a director of the I.C.I., and a member of the finance committee of the board, stated that the figure for maintenance in 1934 had not been loaded. Witness said he confirmed the statement of Sir Albert Wyon that there were no undisclosed profits constituting hidden reserves in the accounts of the subsidiary companies.

Dr. Coates said that it would have been misleading to have indicated to the shareholders of the I.C.I. to assist them in the consideration of their scheme that in the near future there would be large distributable profits earned by the new process of extracting petrol from coal. In his view a larger sum could not have been prudently distributed by the I.C.I. as dividend in the past than there had been. Taking a wide view of all the circumstances of the case, he did not see any reasonable prospect of a substantially larger sum being distributed by way of dividend in the future.

Dr. Coates said he first put the scheme on paper, but before that he discussed the matter with his colleagues. He knew of no complaint by any deferred shareholders of his not having received a dividend in recent years.

The evidence in support of the scheme was concluded on Wednesday.

Opposition to the Scheme

Mr. Henry Morgan, senior partner in Morgan Brothers and Co., accountants, was cross-examined on an affidavit he had sworn in opposition to the scheme. Mr. Morgan said when he expressed the opinion that the deferred shares were worth 22s. 6d., as against 40s. 6d. for the ordinary shares—that being a ratio of one and four-fifths deferred shares to one ordinary share, compared with four to one provided by the scheme—that was a sound valuation on the basis of the value of the assets. That basis was a more reliable guide than past Stock Exchange prices.

Mr. Gavin Simonds, K.C., for the company: Is that view based on the hypothesis that there are large undisclosed profits?—On the hypothesis that there have been some undisclosed profits.

Mr. Morgan added that there had been a big increase in the earning capacity of the subsidiary companies.

Mr. John K. Carruth, chairman of the deferred shareholders' committee, was cross-examined on an affidavit he had sworn. In that document, he said that he had advised Captain Woolf Barnato to buy deferred shares of the I.C.I. on his firm belief, freely expressed, that the years 1934-1936 would see British industry enjoying an era of prosperity greater than any within living memory. Replying to Mr. Simonds, he said he thought British industry enjoyed greater prosperity in 1934 than at any other time in the last 50 years. He expected a continuance of the present prosperity in 1937, and that substantially larger dividends would be paid in the future than in the past.

This concluded the evidence.

Sir William Jowitt summed up his case against the scheme, and the hearing was adjourned until Friday.

THERE has been a steady increase in the quantity of dyes used by the South African soap and candle factories since 1926-27, when only 58,226 lb., valued at £2,321, were used. In 1932-33, 36 soap and candle factories used 101,442 lb. of dyes, valued at £6,280 according to the "Census of Industrial Establishments," published by the Government of the Union of South Africa. This is the first census since 1929-30. The same source also shows that 25 tanneries used dyeing materials costing £10,463.

Notes and Reports from the Societies

Institution of Civil Engineers

The National Debt to the Ministry of Health

MR. JOHN D. WATSON, in his presidential address to the Institution of Civil Engineers, on November 5, briefly referred to recent changes introduced by the Council, which should go far to encourage a more comprehensive outlook and create a better understanding of the interests pertaining to all engineers. These included the introduction of a Journal which, while maintaining continuity with the previous publications of the Institution, would enable members to keep more closely in touch with the work which was being done to promote the science and practice of engineering. He then spoke of the Iddesleigh Commission, whose reports showed that the disposal of sewage into an adequate volume of clean water was sound and proper. The advantages of multiple outlets to ensure quick and effective dispersion were pointed out; although where tides and currents existed near the outfall, such quick mixing by multiple outlets might not be needed; it certainly contributed in all circumstances to the fulfilment of a sound principle. Owing, however, to reductions in the volume of diluent water in certain cases and the necessity of having to discharge sewage effluents into comparatively pure water which might be required for drinking purposes, other systems of sewage disposal had to be adopted, and Mr. Watson referred to the opinion expressed by Royal Commission after Royal Commission that the only way to purify sewage was to irrigate land with it, the famous Craigentinny Meadows having shown the way to do so economically.

Although it was almost unknown twenty years ago, bio-aeration or activated sludge was now established beyond question as one of the most useful methods of sewage purification. When the plant was well designed it was economical and freer from nuisance than any method yet discovered.

Sewage Disposal Developments

It attempted to concentrate the process into the smallest possible space by bringing the sewage, gelatinous growth, and the air into more intimate contact than was possible by any other known process of purification. In terms of sewage-disposal development on the following lines was indicated: (1) The adoption of more hygienic methods of sludge-disposal; (2) the adoption of methods to obviate smell and fly nuisance; (3) the adoption of more reasonable treatment of storm-water; (4) co-ordination of urban districts in watersheds to minimise the number of sewage-works and improve their character; (5) establishment of a separate central authority, or extension of the powers of the Minister of Health, to embrace the duties of the central authority proposed by the Royal Commission on Sewage Disposal, 1898. Although ability to free sewage from smell was not put forward as one of the benefits accruing from bio-aeration when the activated-sludge method of purifying sewage was being lauded between 1915 and 1920, yet, after twelve years' experience, it was safe to say that the bio-flocculation process hardly ever failed to remove all smell from sewage. Incidentally, this could be done practically without cost where bacteria beds were employed to effect nitrification.

Mr. Watson concluded his address by pointing out that, while the nation owed a great deal to the Ministry of Health and to their engineers, there was still much to be done before the goal was reached when there would be no river-pollution. It was obviously impossible to frame a standard of purity that would apply to all cases. His opinion was that a central authority was necessary and that this should be the Ministry of Health rather than the *ad hoc* body suggested by the Royal Commission, provided that sufficient power was given to set up a research department wide enough to include the excellent work which had been done in recent years by the Water Pollution Research Board.

Institute of Chemistry

Bristol Section: Problems of Milk Pasteurisation

A WELL-ATTENDED meeting of the Institute of Chemistry was held at Bristol University on November 4, when an address on the "Scientific Problems of Milk Pasteurisation" was given by Dr. W. G. Savage, county medical officer of health for Somerset, and president of the Society of Medical Officers of Health. Professor W. E. Garner presided at the meeting.

The title of Dr. Savage's paper was deliberately chosen so as to exclude the controversial problems of pasteurisation which, when the pseudo-scientific matters which are often introduced are excluded, really resolve into questions of administrative expediency and changes of commercial practices. On the scientific side, apart from the accepted and recognised risks of raw milk, the main questions were: Does pasteurisation make milk safe? And does it affect the nutritive qualities of milk?

As regards the efficiency of pasteurisation, when properly performed there is no question, since the experimental evidence is complete and conclusive. In this country the only officially recognised method is to heat the milk to 145° to 150° F. and hold it between these temperatures for 30 minutes. A lower temperature is accepted in the United States and, although experimental work shows that this is reliable, a larger margin of safety is prescribed in this country. Such heat conditions destroy tubercle bacilli and all other pathogenic bacteria likely to be found in milk.

Chemical Changes Through Pasteurisation

So much work has been done on the chemical changes caused by pasteurisation that we can speak with some assurance, said Dr. Savage. The proportion of soluble calcium is reduced by about 6 per cent., and possibly the phosphates by about the same amount, while there is partial destruction of vitamin C. Vitamin C is present in such small and variable amounts in milk that it is always wise to supplement it, so this partial destruction hardly matters. The insignificant loss of calcium and phosphorus is a definite advantage since cows' milk contains several times as much of them as human milk, and so far as it goes it tends to make cows' milk a little more comparable to human milk and to that extent it is an advantage.

Important problems arise in securing that pasteurisation is efficiently performed. Having to hold the milk at the given temperature adds to the possibility of error. The pasteurisation plant may be incorrectly designed or improperly used. Possible defects are excess of "foam," dead ends, defective outlet valves, incorrect time control apparatus, inefficient means of usage as regards holding the milk at the correct temperature and inadequate care and sterilisation of the cooler. All these are defects which can be recognised without much difficulty, but demand efficient and trained inspectors. A very great aid to efficient control is the provision of automatic recorders which provide permanent records of the actual temperature at which all the milk was held and the precise time for which such holding continued.

An integral part of any system of pasteurisation is trained and efficient inspectors. Further assistance in both checking the working of a pasteurisation plant and seeing that the milk is kept subsequently under proper conditions is furnished by bacteriological examinations. At present only one standard is required, *i.e.*, that the bacteria should be not more than 100,000 per cubic centimetre any time before delivery to the consumer. Several chemical tests have been tried, continued Dr. Savage; the most recent, that of an estimate of the amount of enzyme phosphatase, promises to be of signal service. This enzyme is present in all milk and fortunately is destroyed under almost exactly the same conditions of time and temperature as that required for official pasteurisation. If, therefore, it is found to be still present it is evidence of

faulty pasteurisation conditions. A reliable method of estimation which can readily be carried out has been evolved which measures the amount of phosphatase present. We are therefore in a position not merely to say whether or not heat treatment has been given, but to measure the degree of efficiency or of inefficiency.

Society of Chemical Industry

South Wales Section : Oxidation and Reduction

SOME aspects of oxidation and reduction formed the subject of a lecture which Professor Henry Bassett delivered to the South Wales Section of the Society of Chemical Industry at Cardiff on October 31.

The historical aspect of the matter and general sense in which the terms one used were first considered, but the lecturer said it was not easy to give an entirely satisfactory definition of these terms any more than it is of valency. The definition of "oxidation" in terms of loss of electrons (and gain of electrons for "reduction") is satisfactory for electrovalent combination but not for other types. Some of the difficulties which arise when combination is due to normal covalency or to co-ordination were discussed. In normal covalency the valency of the combining elements is best referred to as the number of electrons of each atom involved in the process of combination so that in un-ionised HCl the valency of both the hydrogen and chlorine would be one, but since each atom gains and loses an equal amount of electron it becomes rather forced to differentiate them and say that one is oxidised and the other reduced. This is much more evidently so in cases such as CH_4 or CCl_4. Still greater difficulties arise with co-ordination valencies. In $H_3N \rightarrow BF_3$ one could regard the nitrogen as becoming pentavalent, but how about the boron? On the definition applied to normal covalency the boron valency remains unaltered. If one looks upon the co-ordination link as a sort of electrovalency then the N is oxidised and the B reduced, but is this satisfactory? When applied to such ions as $[Cn(NH_3)_4]''$ or $[Cn(H_2O)_4]''$ is the copper to be looked upon as more reduced than it is in the simple Cn'' ion? On the whole, when dealing with compounds formed by covalency or co-ordination, it would seem better to restrict the terms oxidation and reduction to cases where oxygen (and possibly some very closely related elements) are involved.

Reactions such as: (1) $3HClO = 2HCl + HClO_3$; (2) $2CO = C + CO_2$; (3) $2Cu' = Cu + Cu''$ play a very important part in inorganic chemistry. They are found in all cases where an element acts with several valency stages. Most, if not all, are reversible. Some are important technically. Others are of scientific interest as furnishing methods for preparing othermic inaccessible compounds (*e.g.*, $ZrBr_2$ prepared at 350° by the change $2ZrBr_3 \rightarrow ZrBr_2 + ZrBr_4$). Many examples of this type of change were discussed.

Glasgow Section : Colloids and Crystal Growth

A MEETING of the Glasgow Section of the Society of Chemical Industry was held jointly with the Institute of Chemistry and the Chemical Society in the Royal Technical College, Glasgow, on November 1, when Mr. J. G. Roberts, the chairman of the Glasgow Section, presided, and Mr. F. D. Miles read a paper on "Colloids and Crystal Growth."

Mr. Miles, who is on the research staff of Imperial Chemical Industries, Ltd., at Ardeer, said that crystals represented the highest and colloids the lowest degree of organisation of solid matter and therefore his subject was one in which extremes met with unusual and interesting results. He illustrated the effect of a colloid on the crystalline state assumed by a solid, by an example drawn from the explosives industry. He then described the simpler type of abnormal crystal formed under the influence of the water soluble colloids, such as gelatine, albumin and starch. Calcium carbonate, which occurs in modified forms as a product of many vital processes, is especially liable to this influence, but the instances which were illustrated were mainly drawn from the less soluble salts of lead. The well-known effect of colloidal matter in changing the relative stability of various physical modifications of the same substance was pointed out. Examples were given of the alteration of face development which colloids induced in crystals, and emphasis was laid on the fact that water soluble colloids may be distinguished from dyes and other agents in solution by the general rounding of the crystal surfaces which they tend to produce.

After mentioning briefly the production of the more complex growths, Mr. Miles gave an account of work which had been done to determine the influence of absorption during growth and the dependence of this quantity on the concentration of colloid in solution, and ended his paper with a discussion of the structure of these complexes, in which the proportion of absorb-colloid is often unexpectedly high. He said he believed that they consisted of skeletal parallel growths, with layers of colloids in between the crystallites, and that the closest parallel to them was to be found in the dendritic structure of metals.

Manchester Local Sections

Starch, Cellulose and Related Carbohydrates

THE annual conjoint meeting of the Manchester sections of the Society of Dyers and Colourists, the Society of Chemical Industry, the Institute of Chemistry, and of the Manchester Literary and Philosophical Society was held at Manchester, on November 1, when Professor W. N. Haworth, D.Sc., F.R.S., gave an address on "Starch, Cellulose, and Related Carbohydrates." Mr. L. G. Lawrie, the chairman of the local section of the Society of Dyers and Colourists, presided.

At the outset of his address, Professor Haworth described the molecular structure of glucose. He pointed out that, of the several hydroxyl groups in the molecule which are available for providing the point of union of two glucose residues, it is those groups attached to the first carbon atom in one residue and to the fourth carbon atom in a second residue which furnish the oxygen bond uniting two glucopyranose units in both maltose and cellobiose. Although the units participating in the formation of these two substances are structually identical, the products differ markedly, the difference being due to the spatial arrangement of the left-hand components, the α- and β-forms of glucose. Thus starch is formulated on the maltose model and cellulose on that of the cellobiose model. Professor Haworth then referred to a mode of union in which two different hexose units—glucose and fructose—are involved. This he exemplified by the formula of sucrose, which is due to the sharing of a common oxygen atom or glucosidic link situated at the first carbon atom in each hexose.

The repetition of the process of linking, by which more maltose units or cellobiose units are linked together, provides something of a mental picture of the constitution of starch and of cellulose. In the chain of maltose units the sixth carbon atom of each hexose residue appears on one side of the planes of the pyranose rings, whereas in the chain of cellobiose units the sixth carbon atom occurs alternately above and below those planes. Thus the model of maltose presents an unsymmetrical, and that of cellobiose a symmetrical, picture—an arrangement which is in accord with X-ray diagrams of starch and cellulose.

In discussing the chain length and the molecular weight of these substances, Professor Haworth remarked that an approximation had been reached by a gravimetric assay of the end group of methylated cellulose. By this method it has been found that the average length of the cellulose chain consists of about 200 glucose units, whereas starch appears to consist of about 25 such units, the latter representing a molecular weight of approximately 5,000. Although these figures appear to represent the size and weight of the chemical unit of starch, the physical unit may be very much larger owing to aggregation.

Personal Notes

MR. G. J. BELL, whilst retaining a seat on the board of Courtaulds, Ltd., has resigned his managing directorship of the company. He was one of four managing directors, the others being Mr. J. C. Hanbury-Williams, Mr. H. L. Johnson and Mr. J. S. Addison. Forty years ago, before the company became rayon producers, Mr. Bell joined Courtaulds as a silk fabric salesman, and when viscose yarn was produced at Coventry, and woven at the company's silk mills in Essex, he devoted himself to the task of introducing the new type of fabric to the trade. He has been a director since 1916, and managing director since 1920.

Mr. G. J. Bell.

MR. G. S. BAKER, a director of Baker Perkins, Ltd., of Peterborough, left £55,965, with net personalty £55,661.

PROFESSOR HANS SPEMANN, professor of zoology in the University of Freiburg-im-Breisgau, has been awarded the Nobel Prize for Medicine for 1935.

MR. W. J. TRISTRAM, chemist, 64 Whitechapel, Liverpool, was successful by a majority of 1,428 votes, when he contested his seat in the Municipal elections last week as a Liberal in the Childwall Ward of Liverpool.

MR. C. CLARKSON, who ranks as one of the most foremost figures in aviation in this country, has received the appointment of aviation manager of the Anglo-American Oil Co., Ltd.

MR. G. H. BRIGGS, colour and chemical merchant, has removed from Salford to 4 Commercial Street, Knott Mill, Manchester, 15. His telephone number and telegraphic address remain the same (Blackfriars 3657; "Diamine, Manchester").

MR. E. R. GRASSELLI, for many years first vice-president and treasurer of the Grasselli Chemical Co., died in Santa Barbara, California, on October 5. When the Grasselli Chemical Co. became a subsidiary of E. I. Du Pont de Nemours and Co. in 1928, Mr. Grasselli retired from active business.

MR. T. HARDIE has been elected a director of the Gas Light and Coke Co. in place of the late Mr. Thomas Goulden. Mr. Hardie is a member of the Fuel Research Board and a former president of the Institution of Gas Engineers. He has been chief engineer of the Gas Light and Coke Co. since 1922, and was previously chief engineer of the Newcastle-upon-Tyne and Gateshead Gas Co.

NOMINATIONS FOR THE FORTHCOMING GENERAL ELECTION include: Brig.-Gen. Sir W. Alexander (C), for Glasgow Central, a director of the Barter Trading Corporation, Ltd.; Mr. R. Clarry (C), for Newport, chairman of the British Road Tar Association; Mr. Walter Runciman (L. Nat.), for St. Ives; Dr. L. Burgin (L. Nat.), for Luton; Mr. A. Hayday (S), for West Nottingham, joint-secretary of the National Joint Industrial Council for the Gas Industry; Mr. T. H. Hewlett (C), for Clayton, Manchester, chairman and managing director of the Anchor Chemical Co., of Clayton; Mr. Clement Davies (L. Nat.), for Montgomeryshire, a director of Unilever, Ltd. Sir Christopher Clayton, director of Imperial Chemical Industries, Ltd., and chairman of the Liverpool Gas Co., who represented the Wirral division in the last Parliament, is not seeking re-election.

MR. H. HUMPHREYS JONES, of the Liverpool School of Phamacy, unsuccessfully contested the Granby Ward of Liverpool in the Liberal interest.

MR. C. H. MAPES, formerly vice-president of the Mapes Formula Peruvian Guano Co., of New York City, died in Connecticut on October 10.

MR. G. E. BLACKMAN, B.Sc., has left Imperial Chemical Industries to take up an appointment at the Imperial College of Science and Technology.

MR. J. G. M. BREMNER, B.A., B.Sc., F.C.S., has taken up an appointment in connection with the Imperial Chemical Industries' plant at Billingham.

DR. BERNARD SMITH will deliver the Cantor Lectures of the Royal Society of Arts on November 18 and 25, and December 2, at 8 p.m. The subject of Dr. Smith's lectures will be "Geological Aspects of Underground Water Supplies."

MR. J. L. PINDER, B.Sc. (Lond.), and MR. J. SMITH, B.Sc. (Lond.), two students of the Leicester College of Technology, which was placed on the list of institutions recognised by the Institute of Chemistry early this year, have been elected to the Associateship of the Institute of Chemistry.

MR. E. G. HOOPER, 16 Royal Avenue, Chelsea, formerly Deputy Chief Government Chemist, who made a special study of the chemistry of brewing, left £37,550 (net personalty £37,268). His bequests included: To the Chancellor of the Exchequer, £1,000 towards the reduction of the national debt; to the Chemical Society, all bound copies of their journals and his complete set of their annual reports on the Progress of Chemistry; and to the Society of Chemical Industry, his bound volumes of the Society and his complete set of their annual reports on the Progress of Applied Chemistry. He desired that his body be offered for dissection purposes to one of the London hospitals.

DR. S. C. HOOKER died on October 12, at his residence at Brooklyn, New York. He had been seriously ill for only a few weeks. He was in his seventy-second year. Dr. Hooker was born on April 10, 1864, at Brenchley, Kent. He was educated at Queen Elizabeth's Grammar School, Sevenoaks; at the Royal College of Science in London, where he won a first prize and Scholarship in chemistry in 1883; and at the University of Munich, which in 1885 awarded him, at the early age of 21 years, the degree of doctor of philosophy in chemistry. Immediately afterwards he went to the United States in the expectation of pursuing research work in chemistry in one of the universities. Being unable to make satisfactory arrangements in that regard, he accepted a position as chief chemist with the Franklin Sugar Refining Co., in Philadelphia. Dr. Hooker continued to be associated with the sugar refining industry in the United States for 30 years until his complete retirement from business in 1916 to devote his time to research in organic chemistry, to the improvement of his chemical library. At that time he was director of the American Sugar Refining Co. He had previously served as a director of the Spreckels Sugar Refining Co. and of the Great Western Sugar Co. Results of his chemistry investigations, extending over many years, have been published in the chemical periodicals of this country and abroad, and arrangements have been made for the publication of his latest researches which continued to the time of his death.

Dr. S. C. Hooker.

Continental Chemical Notes

Poland

OXALIC ACID MANUFACTURE has been taken up by the Pabjanice Chemical Company.

Russia

ACCORDING TO RUSSIAN PRESS REPORTS the first batch of platinum has been turned out at the electrolytic copper plant at Kycztym, where selenium and tellurium have been made for some time.

Italy

PLANS HAVE BEEN APPROVED for the following projects: Manufacture of phosphorus trichloride, oxychloride and pentachloride (Soc. An. Farmaceuti Italia Schiapparelli, Milan); ethylene oxide (Ing. Orlandi Ugo and Levi Giorgio, Rome); extensions to plant for higher aliphatic alcohols and synthetic waxes (Romano Botazzo and Figli, Bergamo).

France

OWING TO THE UNPLEASANT ODOUR of the sulphur-rich crude Irak oil which has been refined up till now by Compagnie Française de Raffinage, at Gonfreville, the pipe-line leading from the port of Le Havre and running in part through the town itself, has been put out of operation at the request of the municipal authorities. According to official statements a plant for eliminating sulphuretted hydrogen from the oil is in process of erection at Kirkuk and is expected to be completed next summer. In the meantime emergency treating plants are being constructed both at Tripolis and Haifa and should be in operation at the end of this year.

TWO NEW PRODUCTS FROM THE OXIDATION OF PINENE with selenium oxide are myrtenal myrtenol (writes W. S. Zachanicz, in the "Bulletin of the Institute du Pin," July-August, 1935). The yields are dependant upon the amounts of selenium oxide, the latter forming an intermediate product with pinene, subsequent pyrolysis resulting in formation of the aldehyde and alcohol. The same investigator has also prepared verbenol and the corresponding ketone (verbenone) by treating pinene with cobalt abietate in an atmosphere of pure oxygen. All the substances are interesting starting points for new products of potential value in various branches of the fine chemical industry.

Germany

A PROCESS OF THE METALLGESELLSCHAFT A.G., for converting sulphuretted hydrogen or sulphur into sulphuric acid, which has formed the subject of numerous patent specifications in the last few years, is discussed in detail by Dr. W. Siecke, in the "Chemische Fabrik" of October 30. The new process comprises three stages: (1) Oxidation of hydrogen sulphide with sulphur dioxide and water; (2) passage of the burnt gases over a constant layer when further oxidation to sulphur trioxide is effected; (3) conversion of gaseous sulphur trioxide into sulphuric acid in a condensing apparatus. In practice, according to Dr. Siecke, the initial oxidation is effected at a temperature of 750° to 800° C., and the resulting gaseous mixture (containing about 4 to 7 volume per cent. sulphur dioxide and 5 to 8 volume per cent. oxygen) is allowed to enter the contact chamber at a temperature of about 400° C. The contact vessel is equipped with a jacket which can be used for heating when starting up the reaction and for subsequent cooling. The process can be applied to by-products of lithopone and blanc fixe manufacture as well as to many other manufacturing processes in which sulphuretted hydrogen is formed, examples being anthracite distillation, lignite coking processes and the hydrogenation of all sulphur-containing tars and tar oils.

British Celanese, Ltd.

Chairman's Views on Patent Litigation

PRESIDING at the annual meeting of British Celanese, Ltd., in London, on October 1, Dr. Henry Dreyfus, chairman of the directors, took a distinctly cheerful view of the company's prospects in the current year. Profits for the first quarter, he said, had exceeded those of the corresponding period of 1934 by 70 per cent., with the result that the 1½ years' arrears of dividend still outstanding on the first preference shares had already been earned. These arrears might be entirely discharged before the end of the current financial year, and it might be found possible to resume payment of current dividends on the second preference shares "provided no change takes place in general conditions."

With regard to patent litigation, Dr. Dreyfus said the result of the case in which the company was concerned was known to all the shareholders, and while they could have wished for a more favourable outcome, they must accept for the present, at any rate, the decision of the courts. There were, however, two points arising out of this litigation on which he wanted to say a few words. The first was that it had been made apparent that their lack of success was perhaps in the main due to want of experience in matters of this description. This experience they had now gained, and they would not hesitate to use it in the future to prevent others from taking advantage of the vast expenditure which they as pioneers had incurred and were incurring in the creation of a new industry. The recent litigation had made it more than ever clear that the British patent law and procedure as they existed to-day presented great and, in his opinion, unnecessary difficulties to the new inventor, particularly to one who had not at his disposal very substantial financial resources. In this respect the law and practice in this country were much more difficult and complicated than the corresponding laws, for example, in France and America, and on a suitable occasion it was his intention to make representations in the proper quarter in the hope of bringing about some amendment of the situation.

Referring to finance, Dr. Dreyfus said a larger amount had been allocated for research. Shareholders knew how valuable this research had been in the past and there was no need to emphasise how important it would be in the future, in view of all the developments which were expected, and which it was anticipated would maintain the company's leading position in the textile industry.

Institution of Chemical Engineers

THE next meeting of the Institution of Chemical Engineers will take place on Wednesday, November 20, at 6 p.m., in the Rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1, when Mr. R. W. Powell, B.Sc., and Dr. Ezer Griffiths, F.R.S., will present a paper on "The Evaporation of Water from Plane and Cylindrical Surfaces." The chair will be taken by the president, Dr. Herbert Levinstein. This paper will describe work carried out at the National Physical Laboratory on behalf of the Engineering Committee of the Food Investigation Board. The authors will deal with the underlying physical basis of the phenomenon of the evaporation of water from a saturated surface.

Chemical and Allied Stocks and Shares

Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name.	Nov. 7.	Oct. 29.
Anglo-Iranian Oil Co., Ltd. Ord.	68/1½	63/9
,, 8% Cum. Pref.	35/9	34/9
,, 9% Cum. Pref.	37/3	35/6
Associated Dyers and Cleaners, Ltd. Ord.	2/6	2/6
,, 6½% Cum. Pref.	5/3¾	5/3¾
Associated Portland Cement Manufacturers, Ltd. Ord.	65/-	60/6
,, 5½% Cum. Pref.	26/6	27/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	64/4½	61/3
Bleachers' Association, Ltd. Ord.	7/6	6/10½
,, 5½% Cum. Pref.	**12/6**	**11/3**
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/-	48/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	98/9	**97/6**
,, Defd. Ord.	17/6	17/6
,, 5½% Cum. Pref. (£10)	£11	£11
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£102	£104
Bradford Dyers' Association, Ltd. Ord.	10/-	9/4½
,, 5% Cum. Pref.	13/9	12/6
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£88
British Celanese Ltd., 7% 1st Cum. Pref.	25/6	24/6
,, 7½% Part. 2nd Cum. Pref.	23/6	21/6
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/9	5/6
,, 4% 1st Mort. Deb. Red. (£100)	£92	£90
British Cyanides Co., Ltd. Ord. (2/-)	3/6	3/-
British Drug Houses, Ltd. Ord.	18/9	18/9
,, 5% Cum. Pref.	21/3	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	6/9	6/9
,, 8% Pref. (Cum. and Part.)	28/1½	28/1½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	46/10½	46/10½
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First Mort. Deb. Red. (£100)	£106/10/-	£106/10/-
British Oxygen Co., Ltd. Ord.	110/-	107/6
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	112/6	105/-
,, 6% Cum. Pref.	29/6	29/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	18/9	18/9
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	10/7½	8/9
,, 5% Pref. (Cum.)	15/3¾	13/9
Cellulose Acetate Silk Co., Ltd. Ord.	13/9	13/9
,, Deferred (1/-)	2/4½	2/1½
Consett Iron Co., Ltd. Ord.	10/9	9/3
,, 8% Pref.	27/6	27/6
,, 6% First Deb. stock, Red. (£100)	£106	£106
Cooper, McDougal & Robertson, Ltd. Ord.	32/6	32/6
,, 7% Cum. Pref.	28/9	28/9
Courtaulds, Ltd. Ord.	**53/9**	**53/1½**
,, 5% Cum.	24/4½	24/4½
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	29/4½	29/4½
,, 7½% "A" Cum. Pref.	30/-	30/-
Distillers Co., Ltd. Ord.	92/6	92/6
,, 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	21/-	18/6
,, Pref. Ord.	28/9	26/10½
,, 6½% Non-Cum. 1st Pref.	23/3	23/3
,, 8% Non-Cum. 2nd Pref.	20/7½	19/3
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£105	£103
English Velvet & Cord Dyers' Association, Ltd. Ord.	3/9	3/9
,, 5% Cum. Pref.	7/6	7/6
,, 4% First Mort .Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/1½	38/9
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	27/6	27/3
,, 3½% Maximum Stock (£100)	£90	£90
,, 4% Consolidated Pref. Stock (£100)	£106/10/-	£106/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£86/10/-	£86/10/-
,, 5% Deb. Stock, Red. (£100)	£116	£116
,, 4½% Red. Deb. Stock (1960-65) (£100)	£114	£114
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	14/4½	13/1½
,, 7% Prefd. Ord. (10/-)	13/9	13/1½
,, 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/-	35/3
,, Deferred (10/-)	8/10½	8/6
,, 7% Cum. Pref.	33/6	33/-
Imperial Smelting Corporation, Ltd. Ord.	15/-	15/3
,, 6½% Pref. (Cum.)	24/3	24/3
International Nickel Co. of Canada, Ltd. Cum.	$33½	$31¾
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	117/6	116/3
Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	32/-	32/-
,, 8% Cum. "A" Pref.	32/-	32/-
,, 20% Cum. Prefd. Ord.	77/6	76/6
,, 5% Cons. Deb. (£100)	£106	£106
,, 4% Cons. Deb. (£100)	£103	£103
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£40	£40
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	42/6	42/-
,, 1st Pref. 6½% Cum.	31/6	30/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£69	£68/10/-
Reckitt & Sons, Ltd. Ord.	105/-	109/4½
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	40/-	40/-
,, Pref.	46/3	46/3
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£134/10/-	£130/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£107	£107
,, Perpetual 3% Deb. (£100)	£85	£85
,, 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Staveley Coal & Iron Co., Ltd. Ord.	47/6	46/3
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	83/9	80/-
Unilever, Ltd. Ord.	33/1½	31/3
,, 7% Cum. Pref.	28/3	28/-
United Glass Bottle Manufacturers, Ltd. Ord.	41/-	40/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	20/-	18/9
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	8/3	8/3
,, 7% Cum. Pref.	24/4½	24/4½
,, 6% Deb. Red. (£100)	£101	£101

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic materials, perfumery chemicals, essential oils and intermediates. In the coal tar products market the price of naphthalene (purified crystals) has been advanced from £11 15s. to £12 0s. per ton. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Conditions in the London chemical market remain steady and there have been no changes in prices. The coal tar products section also reports no change.

MANCHESTER.—There has been relatively little movement of prices on the Manchester chemical market during the past week and values in most instances present a firm front. In the case of the by-products the recent strong tendency remains a feature and here and there a further stiffening of quotations is reported. Inquiry in connection with contract commitments over varying periods of next year is broadening and a busy period in this connection is anticipated during the next month or six weeks. Actual buying during the past week has been on moderate lines and most sellers indicate a fair call for contract deliveries. The demand for textile chemicals, due to the improvement in Lancashire cotton trade conditions, shows a healthy tendency and somewhat bigger quantities are being taken in to consumption. In other directions little or no contracts in this respect has been reported.

SCOTLAND.—There has again been an improved demand for chemicals for home trade during the week, and rather more inquiry for export. Prices generally continue very firm at about previous figures with only slight changes to report.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. SCOTLAND: Crystals, £26 10s.; powder, £27 10s.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7 · dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 1s. 0½d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21 to £22, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—4s. 10d. to 5s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD, ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36 10s.; brown, £34.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £42 10s.

LITHOPONE.—30%, £16 10s. to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 10s. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3¾d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 17s. 6d. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 8d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINZ SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7d. to 7¼d. per lb.; crude, 2s. 3d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID CRESYLIC.—90/100%, 1s. 9d. to 2s. 3d. per gal., according to specification; pale 98%, 1s. 6d. to 1s. 7d; dark, 1s. 2d. to 1s. 3d.. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £9 per ton; purified crystals, £12 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 2s. 2d. to 2s. 3d. per gal.; pure, 2s. 6d.

XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 4d.

PITCH.—Medium, soft, 32s. 6d. per ton, in bulk at makers' works.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £11 10s.

CHARCOAL.—£4 15s. to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £43 to £46 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 3d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.

WOOD TAR.—£2 to £2 10s. per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price for November delivery is £7 5s. per ton, less 6s., neutral quality basis 20.6% nitrogen in 6-ton lots delivered to farmer's nearest station.

CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: November £6 18s. 9d., December £7, January £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June, £7 5s., delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE)N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

Latest Oil Prices

LONDON, Nov. 6.—LINSEED OIL was firmer. Spot, £26 15s. per ton (small quantities); Nov., £24 5s.; Dec., £24 7s. 6d.; Jan.-April, £24 12s. 6d.; May-Aug., £24 17s. 6d., naked. SOYA BEAN OIL was dull. Oriental (bulk), Nov.-Dec. shipment, £22 per ton. RAPE OIL was slow. Crude extracted, £36 10s. per ton; technical refined, £38, naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £25 per ton; refined common edible, £29 10s.; and deodorised, £31 10s.; naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American spot, 48s. per cwt.

HULL.—LINSEED OIL, spot, quoted £25 2s. 6d. per ton; Nov.-Dec., £24 15s.; Jan.-April, £24 17s. 6d.; May-Aug., £25. COTTON OIL, Egyptian, crude, spot, £25 10s.; edible, refined, spot, £28 10s.; technical, spot, £28 10s.; deodorised, £30 10s.; naked. PALM KERNAL OIL, crude, f.m.q., spot, £23 10s., naked. GROUNDNUT OIL, extracted, spot,£34; deodorised, £37; RAPE OIL, extracted, spot, £35 10s.; refined, £37. SOYA OIL, extracted, spot, £28; deodorised, £31 per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. CASTER OIL, pharmaceutical, 45s. per cwt.; firsts, 40s.; seconds, 38s. TURPENTINE, American, spot, 50s. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Glycols and Glycol Ethers

GLYCOLS and their ethers are freed from chlorine and chlorine compounds by treatment in the vapour phase with mercuric or silver oxide on a carrier such as pumice or asbestos. Preferably the vaporisation of the glycol or glycol ether is effected at a low pressure such as 20 mm. in the case of ethylene glycol. Other glycols and ethers mentioned are diethylene glycol, ethylene glycol monomethyl ether and ethylene glycol monoethyl ether. When the purifying agent is exhausted it may be regenerated by soaking in 7 per cent. caustic soda solution and then heating for instance to 550° C. leaching with water and drying at 100° C. (See Specification 430,234, of F. C. Stephen, and Telegraph Condenser Co.)

Specifications open to Public Inspection

SULPHUR CEMENT.—W. W. Duecker. April 27, 1934. 6746/35.

METHOD OF CONVERTING METALLIC ALUMINIUM with hydrogen chloride.—Ruhrchemie A.-G. April 24, 1934. 10890/35.

METHOD OF INCREASING YIELD in the catalytic synthesis of aliphatic hydrocarbons.—Studien-und Verwertungs Ges. April 25, 1934. 11038/35.

CONVERSION OF UNSATURATED OXY COMPOUNDS to aldehydes, ketones, or substituted derivatives thereof or esters, process.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 23, 1934. 11436/35.

QUATERNARY AMMONIUM SALTS, manufacture.—Soc. of Chemical Industry in Basle. April 23, 1934. 12187/35.

DIRECT PRODUCTION OF PROPYLENE OXIDE, process.—Soc. Française de Catalyse Generalisee. April 24, 1934. 112353/35.

HYDROQUINONES, production.—Kodak, Ltd. April 25, 1934. 12424/35

PLASTICISED CELLULOSE ESTER COMPOSITIONS, production.—Imperial Chemical Industries, Ltd. April 26, 1934. 12608/35.

PLASTICISED CELLULOSE ETHER COMPOSITIONS, production.—Imperial Chemical Industries, Ltd. April 26, 1934. 12609/35.

SOLUTIONS OF BISMUTH SALTS, manufacture.—I. G. Farbenindustrie. April 27, 1934. 12673/35.

COPPER-THORIUM ALLOYS.—W. Guertler. April 28, 1933. 29418/35.

Specifications Accepted with Date of Application

NITROGENOUS CONDENSATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 16, 1934. 437,104.

DERIVATIVES OF UNSATURATED ORGANIC ACIDS, polymerisation.—J. W. C. Crawford and Imperial Chemical Industries, Ltd. March 28, 1934. 437,271.

OLEFINIC HYDROCARBONS, treatment.—A. L. Mond (Universal Oil Products C.). April 13, 1934. 437,188.

COPPER SALTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). April 14, 1934. 437,022.

VAT DYESTUFFS of the anthraquinone series, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 16, 1934. 436,951.

REFINING TREATMENT of relatively low-boiling cracked hydrocarbons, process and apparatus.—A. L. Mond (Universal Oil Products Co.). April 19, 1934. 437,023.

DYEING CELLULOSE ESTERS AND ETHERS, process.—Imperial Chemical Industries, Ltd., L. P. Rendell and H. A. Thomas. April 20, 1934. 437,274.

METHACRYLIC ACID and the alkyl esters thereof, production.—J. W. C. Crawford and Imperial Chemical Industries, Ltd. April 20, 1934. 437,197.

NON-GELANTINOUS BLASTING EXPLOSIVES, production.—W. Morris (E. I. du Pont de Nemours and Co.). April 23, 1934. 437,035.

ALCOHOLS, separation.—E. I. du Pont de Nemours and Co. April 25, 1933. 437,210.

DYESTUFFS OF THE DIOXAZINE SERIES, and of intermediate products therefor, manufacture.—I. G. Farbenindustrie. April 26, 1933. 437,283.

METHYL METHACRYLATE, polymerisation.—E. I. du Pont de Nemours and Co. April 26, 1933. 437,284.

DERIVATIVES OF N-BUTYLAMINO-BENZINE, manufacture.—I. G. Farbenindustrie. April 27, 1933. 437,296.

BUTYL ALCOHOL, processes of producing.—Commercial Solvents Corporation.—June 12, 1933. 437,120.

OBTAINING KETONES FROM ALCOHOLS, methods.—W. W. Triggs (Commercial Solvents Corporation). July 7, 1934. 437,315.

AMINO COMPOUNDS of the quinoline series, manufacture.—A. Carpmael (I. G. Farbenindustrie). July 23, 1934. 437,317.

SULPHO-ACIDS and their salts having capillary-active properties, production.—E. A. Mauersberger. Nov. 29, 1933. 437,143.

CYCLIC COMPOUNDS, process for manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Dec. 2, 1933. 437,072.

PREPARATIONS of 6-methylamino-2-methyl-2-heptene, production. Knoll A.-G. Chemische Fabriken. April 27, 1934. 437,004.

PRODUCING SULPHUR through reduction of gases containing sulphur dioxide, method. A. R. Lindblad. March 5, 1935. 437,236.

SYNTHETIC RESIN COMPOSITIONS, preparation.—H. I. Waterman and A. R. Veldman. March 14, 1934. 437,085.

GELATINE PRODUCTS and the like, and their manufacture.—Deutsche Hydrierwerke A.-G. April 7, 1934. 437,243.

MINERAL OILS and methods of refining the same.—British Thomson-Houston Co., Ltd. May 19, 1934. 437,174.

Applications for Patents

(October 24 to 30 inclusive.)

ZINC MUDS, ETC., treatment.—F. Becker, W. Becker and O. Englert. 29832.

UNSATURATED KETONES, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 29964.

ORGANIC ESTERS OF CELLULOSE, method of making.—British Celanese, Ltd. (United States, Oct. 26, '34.) 29681.

ORGANIC GASES, manufacture.—British Celanese, Ltd., and R. Page. (United States, Oct. 26, '34.) 29821.

NEW PRODUCTS CONTAINING FLUORINE, manufacture, etc.—A. Carpmael (I. G. Farbenindustrie). 29499.

SULPHONATION PRODUCTS, manufacture.—C. E. Every-Clayton (Chemische Fabrik Stockhausen and Cie). 29557.

CAUSTIC SODA, manufacture.—I. L. Clifford and Imperial Chemical Industries, Ltd. 29430, 29431.

GLASSES RESISTANT TO ALKALI METAL VAPOURS, etc., manufacture. Corning Glass Works. (United States, Nov. 6, '34.) 29541.

HYDROCARBONS OF LOW BOILING POINT, manufacture.—Coutts and Co. (I. G. Farbenindustrie). 29838.

METAL ALKYL COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co. (United States, Oct. 27, '34.) 29630.

COMPOSITIONS CONTAINING FORMAMIDE.—E. I. du Pont de Nemours and Co. ((United States, Oct. 26, '34.) 29757.

HIGHLY-ACETYLATED CELLULOSE, manufacture.—L. S. E. Ellis (Koetschet). 29894.

DYES FOR PHOTOGRAPHIC SILVER HALIDE EMULSIONS, manufacture. Gevaert Photo Producten Naamlooze Vennootschap. (Austria, Oct. 27, '34.) 29702.

AROMATIC CARBOXYLIC ACID CHLORIDES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 29505.

COPPER-THORIUM ALLOYS.—W. Guertler. (April 30, '34.) (Germany, April 28, '33.) 29418.

CRACKING OF HYDROCARBON OILS.—Gyro Process Co. (United States, Oct. 29, '34.) 29885.

SULPHATES, ETC., manufacture.—G. W. Johnson (I. G. Farbenindustrie). 29377.

OLEFINES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 29378.

Company News

Central Oil, Mining and Chemical Trust.—The report for the year ended April 30, 1935, states that revenue account debit balance amounts to £558; to this is added £9,861 brought forward, making debit balance of £10,419 to be carried forward.

The International Nickel Co. of Canada.—The quarterly dividend rate has been raised from 20c. to 25c. This is the second successive increase in the company's dividend rate. On August 6 the payment was raised from 15c. to 20c. a quarter. The first six months earnings' report was issued eight days after the last dividend announcement, on August 14. It showed net earnings of 64c. per common share, against 62c. in the corresponding period of 1934. The second quarter accounted for more than its share of the improvement, the first three months being slightly less profitable than the same period a year earlier.

Wall Paper Manufacturers.—After providing for tax the profit is £741,557, an increase of £57,778 on last year's figure of £683,779. After paying debenture interest and preference dividend and the balance of interest paid under agreements for purchase of new businesses, the directors recommend a final dividend of 5 per cent. on the ordinary stock, again making 10 per cent. for the year. The final payment on the deferred stock is 7½ per cent., bringing the year's distribution up to 12½ per cent., the same as that paid the previous year. The allocation to staff and employees' pension funds repeated at £10,000 and £100,000, against nil, is applied in reduction of goodwill. The transfer to reserve is halved at £50,000. A sum of £279,275 is carried forward, against £282,825 brought in.

From Week to Week

FORD AND KNIGHTS FERTILISERS, LTD., of Central Buildings, 24 Southwark Street, S.E., have changed their name to Ford's Organic Fertilisers, Ltd.

SIR JOHN CADMAN, the managing director of the Anglo-Iranian Oil Co., in answer to Mr. Lloyd George's criticism of the company on October 30, said that oil was being supplied completely in accordance with the terms of the sanctions—that is, cash on delivery.

EDINBURGH UNIVERSITY COURT has expressed its gratification at the intimation that the Rockefeller Foundation had made a grant of £1,500 to the Department of Medical Chemistry, to provide for the expenses of Professor Barger's research work in vitamin B1, for a period of three years from October, 1935.

SIR ROBERT TASKER asked Mr. F. Berry, chairman of the Town Planning Committee, in the House on October 29, whether as a result of the Wapping fire the question of permitting crude rubber to be stored in large quantities in congested areas would be considered. Mr. Berry said that there was no specific control over the storage of crude rubber. A full report would be submitted at an early date.

THE BOARD of British Coal Distillation, Ltd., has entered into a contract for the disposal of the company's process rights in Canada. Under this agreement Mr. Albert Grant, of Kitchener, Ontario will form two companies for the purpose of constructing a minimum of eight distillation plants each capable of distilling 450 tons of coal a day. The first two plants will be begun forthwith. The construction will be carried out by Canadian Vickers Construction Co. of Montreal. Under the contract British Coal Distillation, Ltd., will be entitled to a royalty, based on the coal treated.

A MEETING OF THE RESEARCH FUND COMMITTEE of the Chemical Society will be held next month. Applications for grants, to be made on forms obtainable from the assistant secretary, must be received on or before December 2. Applications from Fellows will receive prior consideration. The income arising from the donation of the Worshipful Company of Goldsmiths is principally devoted to the encouragement of research in inorganic and metallurgical chemistry, and the income from the Perkin Memorial Fund is to be applied to investigations relating to problems connected with the coal tar and allied industries.

HULL FINANCE COMMITTEE on October 31 approved a grant of £75 being made to the Hull Radium Trust. It was explained that representatives of the Health Committee had been informed by representatives of the trust that unless some assistance was obtained from the corporation the trust would have to be wound up. In that event the corporation would have to purchase a supply of radium, the cost of which would be £3,000, and there would also be a charge of £150 a year for maintenance. The financial position of the trust is to be reviewed in six months' time.

MR. JUSTICE GOODARD gave judgment against a plaintiff firm of Yorkshire cheese manufacturers on a special paper in the King's Bench Division on November 4. The firm was Alfred Rowntree and Sons, Ltd., of The Dairy, Covenham, Middleham, Yorkshire, and the defendants were Frederick Allen and Sons (Poplar) Ltd., and Phoenix Chemical Works, Upper North Street, Poplar. The point the Judge was asked to decide was whether plaintiffs could sue Frederick Allen and Sons, Ltd., for alleged breach of contract in respect of caustic soda supplied to plaintiffs for use in the testing of cheese. The caustic soda was below strength, and the cheeses were faulty.

FROM REMOTE TIMES members of noble families have interested themselves in the industries of countries to the extent of sponsoring and naming colours in various products and these colours are still known by the names given to them by their noble sponsors. In recent history the Queen has christened a blue colour "Jubilee"; the Duchess of York associated her name with "Margaret Rose"; and the duchess of Kent gave her name to "Marina Green." To mark the occasion of their wedding, the Duke of Gloucester and Lady Alice Scott have both sponsored colours for the British Colour Council. The Duke has sponsored "Gloucester Green," an attractive dark bluish-green; the choice of Lady Alice Scott is a beautiful rust red to be known as "Kenya Red."

PRODUCTION HAS BEGUN with Europe's largest blast furnace at Stewart and Lloyds' steelworks, at Corby, Northants. Furnace No. 3, which has been under reconstruction since February, was lit by Miss Rosemary Menzies Wilson, daughter of the production manager and director of the firm, on November 2, using a specially inscribed silver torch. The ceremony was witnessed by Mr. A. C. MacDairmid, chairman of Stewart and Lloyds, and numerous other officials. The furnace will be alight for seven years continuously. In that time, it is expected, about a million tons of iron ore from the Corby pits will pass through it. The lighting of the reconstructed furnace marks the completion of Stewart and Lloyds' great Corby steel scheme, which has cost approximately £3,000,000. Now 3,000 men are employed against 800 at the beginning of last year.

THE MANCHESTER OFFICE of Worthington-Simpson, Ltd., will be transferred on November 30 from Northern Assurance Buildings, Albert Square, to more commodious and important premises at 74 Corporation Street, Manchester, 4. Telephone: Blackfriars 3810. Telegrams: Condenser.

CONSIDERABLE DAMAGE WAS DONE by fire at the Cadishead works of British Tar Products, Ltd., on October 31. The flames originated in a crude tar still and speedily involved the adjoining "pitch lake." A high wind swept the flames away from a number of benzol tanks.

OLD FINSBURY STUDENTS can obtain tickets for the 18th Streatfield Memorial Lecture by Mr. E. R. Andrews on "Chemistry in Local Government Administration," on December 20, 1935, at 8 p.m., from Mr. F. R. C. Rouse, honorary secretary of the Old Students' Association, 15 Clifton Gardens, Golders Green, N.W.11.

AN EXHIBITION AND SYMPOSIUM of short papers dealing with some recent advances in analytical technique will be held by the Institution of Petroleum Technologists at the Royal Society of Arts, John Street, Adelphi, W.C.2, from 4.30-7.30 p.m. on Tuesday, November 12. The papers will deal with "Quenching Oils," "A Porosity Meter for measuring effective porosity of stone," "Ball and Bucket Viscometer," "A Laboratory Vacuum Distillation Unit," and "The Measurement of the Electrical Resistance of Paint Films under Water."

COURTAULDS, LTD., announced on November 1 that they are to erect a new facory in Flintshire. The site will be at Greenfield, near Holywell. The firm has already three large factories in the district, employing about 6,000 people, while a fourth is practically completed which will employ about 1,500. No information was available, however, concerning the staff to be employed at the new Greenfield factory, or the opening date. Last March it was stated that other expansion plans of the firm embrace a factory at Plymouth costing £250,000.

A NEW TYPE OF WAGON will affect the earnings of limestone quarry workers at Buxton. Known as "T.S.D.," it is being introduced by Imperial Chemical Industries (Lime), Ltd., who claim that stone fillers, working with the same effort as before, will be able to increase their output. They suggested to the Industrial Court, therefore, a reduction in tonnage rates from five to ten per cent. The men's union resisted, saying that it was the breaking and preparing of the stone that really mattered. The court has ruled a reduction of two and a half per cent. when this wagon is employed.

A NEW NON-HYGROSCOPIC WATER DISPERSIBLE OIL (diglycol laurate) is now being produced commercially by the Glyco Products Co., of New York City. It is practically odourless, light straw coloured, non-viscous and completely soluble in all proportions in alcohol, mineral and vegetable oils, and hydrocarbons. It is self-emulsifiable in water and acts as an excellent emulsifying agent for other oils and solvents. Because it is soluble in alcohol, it replaces castor oil where an alcohol soluble oil is required, being practically odourless and free from "tack" and easily removed by cold water. Diglycol laurate is recommended for the manufacture of emulsions in the paper, textile, leather, cosmetic, polish and other industries.

JAPANESE PAPERS REPORT the claim of the Nitto Spinning Company of Osaka to have invented a high-grade staple fibre, said to be the first of its kind. According to the reports only one brand now in existence resembles it—the Dupont "acetate." The new fibre is hollow, which makes it tough, elastic, and light, and removes some of the principal defects of staple fibres. The company's Fukushima mill is reported to be planning to devote half its daily capacity of ten tons to the fibre. The fibre is said to cost only a little more than ordinary fibre. The company plans to produce a gassed yarn of 100 counts at a price below that of ordinary cotton yarn. The new product is expected to encroach upon the fields of spun silk and rayon yarn.

New Companies Registered

Fertilizer Products Co., Ltd., 373 Tantallon Road, Glasgow, S.1.—Registered October 29. Nominal capital £2,000. Manufacturers, importers and exporters of, agents for and wholesale and retail dealers in all chemical products and disinfectants, fertilisers, manures, etc. Directors: A. E. Le Neve, Peter C. Simpson, R. M. Kirkwood.

Oilshale Development, Ltd., Salisbury House, Richmond Hill, Bournemouth.—Registered November 4. Nominal capital £15,000. To adopt an agreement with Dr. Max J. Stephen for the acquisition of certain rights; to acquire any patents and the like relating to the extraction of benzine, motor and aviation spirit, volatile gases, compounds and by-products, products of oil-tar and ammoniacal liquor, and coke and other residuals by the treatment of coal and other bituminous deposits, and to carry on the business of manufacturers and producers of and dealers in oils, petrol, etc. Directors: Max J. Stephan, Edward F. Southby.

Forthcoming Events

LONDON

Nov. 12.—British Association of Refrigeration. Informal meeting. British Industries House, Marble Arch, London.

Nov. 12.—Pharmaceutical Society of Great Britain. Harrison Memorial Lecture. Professor Arthur Smithells. 8.30 p.m. 17 Bloomsbury Square, London.

Nov. 13.—Royal Society of Arts. "The Manufacture of Humus by the Indore Process." Sir Albert Howard. 8 p.m. John Street, Adelphi, London.

Nov. 14.—Institute of Vitreous Enamellers (Southern Section). "Frit-Kiln Bricks." W. Hugill. 8 p.m. British Industries House, Marble Arch, London.

Nov. 14.—Mineralogical Society. General meeting. 5.30 p.m. Burlington House, Piccadilly, London.

Nov. 14.—The Chemical Society. The Brauner Memorial Lecture, by Dr. S. I. Levy. 8 p.m. Burlington House, Piccadilly, London.

Nov. 15.—Royal Institution. "Synthesis of a Natural Colouring Matter." Robert Robinson. 9 p.m. 21 Albemarle Street, London, W.1.

Nov. 15.—Chemical Engineering Group. "The Handling and Storing of Acids." T. J. Dixon and F. Roffey. 8 p.m. Burlington House, Piccadilly, London.

BRISTOL

Nov. 11.—University of Bristol. Recent Advances in Catalysis. Dr. E. B. Maxted. Lecture 3. Progress in Industrial Catalysis. 5.15 p.m. University, Bristol.

GLASGOW

Nov. 11.—Institute of Metals (Scottish Section). Chairman's Address. J. W. Donaldson. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

Nov. 13.—Institution of the Rubber Industry (Scottish Section). "Time Study as an Essential Element of Works Organisation." D. Burns. 7 p.m. 39 Elmbank Crescent, Glasgow.

Nov. 15.—Institute of Chemistry and Society of Chemical Industry (Glasgow Sections). Tatlock Memorial Lecture. "Recollections of an Anaytical Chemist." R. T. Thomson. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

LEEDS

Nov. 14.—Institute of Brewing (Yorkshire and North-Eastern Section). "Recent Developments in the Research Work of the Institute." Professor R. H. Hopkins. 7 p.m. Hotel Metropole, Leeds.

MANCHESTER

Nov. 14.—Institute of Brewing (North of England Section). "Cleansing and Sterilisation of Bottles." E. O. Rounsefell. Midland Hotel, Manchester.

Nov. 15.—Oil and Colour Chemists' Association. Annual Dinner and Carnival Dance. 7.30 p.m. "The Manchester," Ltd., Royal Exchange, Manchester.

Nov. 15.—Society of Dyers and Colourists (Manchester Section). "Staybrite Steel as Applied to the Dyeing Industry." G. Godber. 7 p.m. 36 George Street, Manchester.

NEWCASTLE-ON-TYNE

Nov. 12.—Institute of Chemistry (Newcastle-on-Tyne and North-East Coast Section). Joint meeting with the Institute of Metals. "The Zinc Industry." Stanley Robson. Newcastle-on-Tyne.

STOKE-ON-TRENT

Nov. 11.—Ceramic Society. "Recent Advances in Ceramic Firing." L. Bullin. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

SWANSEA

Nov. 12.—Institute of Metals (Swansea Section). Chairman's Address. Roosevelt Griffiths. 6.30 p.m. Y.M.C.A., Swansea.

WORKINGTON

Nov. 15.—West Cumberland Society of Chemists and Engineers. Social Evening. 7 p.m. Workington.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALARCAL, LTD., Wembley, electro-metallurgists, etc. (M., 9/11/35.) Reg. Oct. 26, series of £5,000 debs., present issue £2,500; general charge.

DAVEY, PAXMAN & CO. (COLCHESTER), LTD., engineers. (M., 9/11/35.) Reg. Oct. 25, £25,000 (not ex.) deb., to Barclays Bank, Ltd.; general charge (ranking in priority to the 6½% deb. stock of company). * £54,800. Aug. 9, 1935.

NORTH BRITISH RAYON, LTD., London, W.C. (M., 9/11/35.) Reg. Oct. 23, three bonds of corroboration, etc., increasing sum secured by deeds dated Jan. 22, 1931, and June 21, 1934, by £10,000, £10,000 and £10,000 (from £50,000 to £80,000); also reg. Oct. 23, three agreements, etc., increasing sum secured by deb. dated Dec. 23, 1930 (as extended by agreement dated May 3, 1934) by £10,000, £10,000 and £10,000 (from £50,000 to £80,000) all to Williams Deacon's Bank, Ltd.; charged on properties originally charged. * £45,495. Nov. 15, 1934.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the South African Railways and Harbours Administration is calling for tenders, to be presented in Johannesburg by November 25, 1935, for the supply of aviation fuels as follows:—Schedule 1, 77 Octane Standard Fuel; Schedule 2, 88 Octane Standard Fuel; Schedule 3, 87 Octane Standard Fuel. (Ref. T.Y. 139.)

France, Algeria, Tunis and Morocco.—A firm established at Lyons wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemical products, gum, mother of pearl, powdered gold, silver and aluminium. (Ref. No. 425.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields are calling for tenders, to be presented in Buenos Aires by November 28, for the supply of 2,000 metal cabinets for housing one complete supergas outfit (two cylinders and one regulator) each. (Ref. T.Y. 10191.)

Books Received

Official Publications

Further Experiments Upon the Water-Gas Process. Department of Scientific and Industrial Research. Fuel Research Technical Paper No. 43. London: H.M. Stationery Office. Pp. 58. 1s.

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